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HANDBOOK

FOR THE

18-PR. Q.F. GUN.

LAND SERVICE.



1909.



LONDON:
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Price One Shilling.



AMENDMENT TO THE

HANDBOOKS FOR 13 AND 18-PR Q.F. GUNS.

Q.F. 13-pr. Page 7. *After* line 26 :—

Q.F. 18-pr. Page 7, *After* line 34 :—

Insert the following paragraph :—

40/W.O./1275 "Should a jam occur after firing, care must be taken to see that the striker is flush with the rear end of the striker guide block before force is used to open the breech. In cases where the striker is not flush with the guide block, withdraw the keep pin and hinge bolt of the breech mechanism lever and remove the lever, guide block, firing lever and striker from the gun. Replace the breech mechanism lever and hinge bolt, and swing the breech screw and carrier into the loading position. Replace the striker, firing lever, and guide block."

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HANDBOOK FOR THE 18-PR. Q.F. GUN (LAND SERVICE) 1909.

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AMENDMENTS.

Page 23, line 20 from bottom. *After* "horizontal" *insert* an asterisk, and *add* a footnote as follows:—

"* Should any correction for droop be required, this must be taken into consideration when carrying out this test."

Page 27, line 22. *Delete* "fuze" and *insert* "degree."

Page 36. *Delete* lines 23, 24, and 25, and *insert* after line 31:—

TO CHANGE TARGET.

TO OBTAIN PARALLEL LINES OF FIRE TO A NAMED GUN.

TO ASCERTAIN THE LOWEST ELEVATION AT WHICH THE TRAJECTORY WILL CLEAR THE CREST.

TO ASCERTAIN WHETHER THE TRAJECTORY WILL CLEAR THE CREST OR INTERVENING OBSTACLE—THE RANGE AND ANGLE OF SIGHT BEING KNOWN.

Page 37. *Delete* line 25 "The second senior . . 10."

Page 37, line 29. *After* "Loader" *insert* "and Fuze setter."

Page 37, line 30. *After* "Fuze" *insert* "and Corrector."

Page 37, line 32. *For* "gun wheels" *substitute* "muzzle."

Page 39. *Under* heading "PREPARATION FOR ACTION" *insert* before the last two lines after "action"

"Breech and muzzle covers may be replaced if necessary."

Page 40. *After* line 24 *insert*:—

"He should always level the sight clinometer when laying direct."

Page 40, line 27. *After* "loads" *insert* "and assists in setting fuzes, if required."

Page 40. *Delete* lines 30, 31 and 32, and *substitute*

"5 sets fuzes and issues ammunition."

"6 sets the corrector, calling out the length of fuze, and assists 5 in his duties."

Page 40, line 33. *Delete* "5 and 6" and *substitute* "He."

Page 40. *Under* heading "SIGNALS" *delete* the asterisk and footnote.

Page 41, line 14. *After* "traversing gear" *delete* "to" and *substitute* "so that the breech is."

Page 41, line 23. *Delete* "and adjust the indicator" and *substitute* "and 6 adjusts the fuze indicator."

(1166) Wt 27014/237 6,000 1/10 M & Co. P09/470



Page 41. *After* line 36 *insert* as follows :—

" *Action Right, Left and Rear are the same except that at*

Action Right.—The trail is carried round a quarter of a circle only.

Action Left.—The trail is carried round a quarter of a circle to the right, in this case shifting round the trail eye.

Action Rear.—The trail is not carried round.

When on a 'side' slope, *Action Front* or *Action Rear* only should be resorted to, and in the former case the trail should always be carried round down hill."

Page 41, line 3 from bottom. *Under* heading "TO LOAD," *delete* "or 6."

Page 42. *Delete* lines 3 to 6, and *substitute* as follows :—

"If the order '*Corrector . . . . . Range*' is given, 6 will set the fuze indicator as ordered and call out the length of fuze.† 5 will set the fuze by hand or with the '*Key, fuze setting.*'

During ranging for elevation, as soon as the gun is reported '*Ready*' and '*Set,*' 1 will hold up his hand, and, should he see that the Section Commander does not observe his signal, he will call his attention by reporting his gun '*Ready.*'"

Page 42. *Insert* footnote—" † This is to give the Section Commander an opportunity of checking the length of fuze."

Page 42. *Under* heading " MISS-FIRE " *insert* new paragraph at end *after* "changed" :—

" When firing blank ammunition—

(a) Should a miss-fire occur none of the detachment should be directly in rear of the breech when it is opened after the lapse of time as laid down in Section 47, Field Artillery Training (1909 amendments).

(b) As a further safeguard, with guns using case ammunition the Nos. 1 of gun detachments should be held responsible that the charge is properly home in the case before the round is loaded. This can be done by pressing down the leather board cup on the point of the traversing lever, a small mark being made under local arrangements on each traversing lever, to indicate when the charge is in its correct position."

Pages 42 and 43. *Delete* from heading "MAGAZINE FIRE" on page 42 to ". . the old hole" line 18, page 43.

Page 43. *Insert* at bottom of page *after* "round" :—

"If an alteration in range or corrector has been ordered 4 will reset the fuze."

Page 44, line 11. *Delete* from "telescope" to end of sentence and *substitute* "dial sight and telescope if in use."

Page 45, line 11 *Delete* the word "then.'

Page 45. *After* line 15 *insert* the following new paragraphs :—

"TO OBTAIN PARALLEL LINES OF FIRE TO THAT OF A GUN WHOSE LINE IS CORRECT."

The order is "*Parallel lines to No. . . . . .*"

There are two methods of doing this—

(a) Using the dial sight of the named gun as a director, in connection with an aiming point.

When this order is given the named gun lays correctly on its aiming posts with the gun moved to zero traverse by shifting the trail. All other guns are set to zero traverse. The named gun measures the angle between the target and a conspicuous aiming point. This

angle with the necessary distribution or concentration (*vide* page 75 "Field Artillery Training") is given to the remaining guns. Either all aiming posts are taken up and replanted in line, over the rocking bar sights at zero; or, without moving the guns, the deflection leaves are adjusted so as to cover the existing aiming posts.

(b) Using the dial as a director for giving individual lines of fire to each gun (*vide* Section 41 (1) (b) "Field Artillery Training").

Here again the traverse of all guns must be at zero, the named gun being first correctly laid with its traverse at that point. This method, however, is not recommended.

N.B.—Information should be given to the other guns should any correction for difference of level of wheels be included in the angles given, in case such correction may not apply to them.

TO ASCERTAIN THE LOWEST ELEVATION AT WHICH THE TRAJECTORY WILL CLEAR THE CREST (OR INTERVENING OBSTACLE).

(a) When the gun is close behind the crest:—

"Set the sight clinometer at the angle of sight ordered and level the bubble. Then, using the handwheel on the right side, elevate the gun until the bottom of the bore just clears the crest.

The 'Range Indicator' will then show the lowest elevation which will clear the crest."

(b) When the gun is some distance behind the crest:—

"Proceed as in (a), but, to the elevation on the 'Range Indicator' must be added the elevation in degrees due to a liberal estimate of the distance to the crest, or intervening obstacle. The 'Range Indicator' will then show the lowest elevation which will clear the crest."

In each case, if no angle of sight has been sent down to the battery, carry out the above operations with the sight clinometer set at 'zero.' Then, if the subsequent angle of sight is one of 'elevation,' the trajectory will clear at an elevation less by the amount of such angle of sight; if one of 'depression' an elevation greater by that amount will be required."

"TO ASCERTAIN WHETHER THE TRAJECTORY WILL CLEAR THE CREST OR INTERVENING OBSTACLE—THE RANGE AND ANGLE OF SIGHT BEING KNOWN.

(a) When the crest or obstacle is just in front of the gun:—

Lay the gun with the angle of sight and range ordered. Look along the lower edge of the bore and if this clears the crest the trajectory will clear.

(b) When the crest or intervening obstacle is some distance in front of the gun:—

Proceed as in (a), then reduce the elevation till the line of the bore just clears this obstacle. If now the amount by which the elevation is reduced (in degrees) is greater than the elevation due to a liberal estimate of the range to the obstacle, the trajectory will clear. If it is less, it will not clear.

Page 46, line 4. *After* "the shield" *delete* "and", and *substitute* "3."

War Office, S.W.
31st December, 1909.

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PLATES.

N.B.—*This book is corrected up to January, 1909. Any alterations which may be suggested should be forwarded direct to Chief Inspector, Royal Arsenal, Woolwich.*

HANDBOOK

FOR THE

18-PR. Q.F. GUN.

ORDNANCE, Q.F. 18-PR.

DESCRIPTION.

Material		.. .. ..	Steel (wire construction).
Weight (with breech fittings)			9 cwt.
Length, total ..		.. ..	96·96 inches.
Bore,	calibre	.. ..	3·3 inches.
	length (to face of breech screw)	..	92·62 inches.
Rifling,	system	.. ..	Polygroove, modified plain section.
	length	.. ..	80·232 inches.
	twist	.. ..	Uniform, 1 turn in 30 calibres.
	grooves,	number	18.
		depth	·04 inch.
		width	·384 inch.
Firing mechanism		.. ..	Percussion.

MARK I GUN.

(Plate I.)

The gun is made of steel, and consists of the A-tube, a series of layers of steel wire, jacket, and breech ring. The A-tube extends from the rear end of the chamber to the muzzle. Over a portion of the A-tube are wound successive layers of steel wire. The jacket is fitted over the exterior of the wire and A-tube, and is secured longitudinally by corresponding shoulders and the breech ring, which is screwed over the jacket at the rear, and secured by a set screw. The breech ring is prepared for the reception of the breech mechanism, and is provided on the upper side with a lug for the attachment of the hydraulic buffer. Longitudinal projections on each side of the jacket form guides for the gun when in the cradle of the carriage.

MARK I* GUN.

Mark I* guns are Mark I guns repaired by the renewal of the "A" tube.

The repair consists in fitting into the old jacket under hydraulic pressure, a new "A" tube with new wire winding. The exterior of the "A" tube with its wire is slightly tapered, and the interior of the jacket is bored to correspond.

Mark II Gun.

(*Plate I.*)

Mark II guns differ from Mark I as follows:—

The exterior of the A-tube is slightly conical, the interior of the jacket being coned in a corresponding manner to admit of the guns being built up by means of hydraulic pressure instead of by shrinkage.

Marks I, I* and II Guns.

The chamber is slightly coned throughout its length, to facilitate the extraction of the cartridge.

A plane for clinometer is prepared on the upper surface of the breech ring.

An axis line is cut at the breech on the right side. Vertical and horizontal lines are also cut on the muzzle face and horizontal lines on the breech face.

Breech Mechanism.

(*Plate II.*)

The guns are fitted with "Single Motion Breech Mechanism." The mechanism is so arranged that by one pull on a lever the breech is unlocked and the screw and carrier are swung into the loading position. After loading, one thrust on the same lever inserts the breech screw into the breech opening and turns it into the locked position.

Breech Closing Mechanism.

The breech is closed by a steel screw tapering towards the rear. Segments of the screw thread are removed from opposite sides of the screw, and the breech opening of the gun being prepared in a corresponding manner, admits of the screw being locked in the gun by the fourth of a turn.

The screw is provided on the rear end with left hand screw threads which engage with corresponding screw threads in the inner face of the carrier.

The carrier for supporting the breech screw when withdrawn from the gun consists of a steel arm, hinged to the right side of the gun at the breech. It is prepared on the inner face for the reception of the breech screw, and on the outer face with a recess for the striker guide block and two lugs for the hinge bolt of the breech mechanism lever. A steel catch with spiral spring is fitted to the interior of the carrier and serves to retain the breech screw in the open position. The catch is automatically released in closing the breech.

Hinged to the rear face of the carrier is a breech mechanism lever provided with bevel teeth which engage with corresponding teeth on the rear face of the breech screw, so arranged that when the lever is pulled to the right, the first movement of the lever unlocks the breech screw, and on continuing the motion, the screw and carrier are swung into the loading position.

The breech mechanism lever is retained in the closed position by means of a catch with flat spring, pivoted in the lever, one end of which engages a recess in the lower lug on the rear face of the carrier.

Firing Mechanism.

(Plate III.)

The firing mechanism is for percussion firing, and is so arranged that the gun cannot be fired before the breech screw is locked and the breech mechanism lever home.

It consists of a striker (A), with firing pin (B), rebound block (C), and securing pin (D), main spring (E), guide for spring (F), and tripping piece (G), with flat spring (H), and fixing screw, fitted through the centre of the breech screw and retained in position by the striker guide block on the carrier. A steel firing lever (J), in the interior of the striker guide block serves to cock the striker and fire the gun, one end of the lever engaging with the tripping piece and guide for spring, and the other end with the trigger in the left side of the gun when the breech is closed.

The trigger is actuated by a direct pull on the firing gear of the carriage thus partially revolving the firing lever by means of which the striker is forced to the rear, and the guide for spring to the front, compressing the main spring until the projecting toe on the inner end of the firing lever slips past the front end of the tripping piece in the striker guide block, when the striker is free to go forward with momentum due to the energy stored up in the compressed main spring, and detonates the cartridge in the gun.

The firing lever is returned to the firing position by means of the guide for spring.

The front end of the firing pin in the striker is withdrawn within the firing hole bush by means of a rebound block in the striker which engages a recess in the breech screw for its reception.

A loop is provided on the lower part of the trigger for the attachment of a firing lanyard if required.

A safety catch with flat spring is fitted to the striker guide block for retaining the striker in the uncocked position, thus admitting of the gun being travelled with a cartridge in the bore.

Note.—The hook of the firing lanyard is of special pattern and must be attached to the loop on the trigger as shown on Plate IV.

Extractor.

The extractor is of steel, and is hinged to the right side of the gun. On the inner end are two arms which clip the rim of the cartridge, the outer end forming a lug by means of which the extractor is automatically actuated in opening the breech.

Pin Firing Dummy and Screw Breech Dummy.

The above-mentioned fittings are provided for drill and instructional purposes, and are intended to prevent wear to the service mechanism and breech opening of gun.

The dummy firing pin differs from the service pin in not having the portion which projects through the firing hole bush.

The body of the dummy breech screw is of wood having front and rear bronze plates, and a copper alloy ring with screw thread which engages the screw threads in the breech opening of the gun. The rear plate is arranged to fit the carrier, and is provided with bevel teeth corresponding with those on the breech mechanism lever. The interior of the breech screw is recessed for the reception of the service striker with firing pin removed and dummy firing pin substituted. The interior of the front plate is fitted with an indiarubber pad to take the blow of the dummy firing pin when the trigger is pulled.

Instructions for Removing and Replacing Breech Fittings.

To remove the Breech Fittings.

Before commencing to remove the fittings the breech screw and carrier should be swung into the loading position.

Breech Mechanism Lever, Guide Block, Firing Lever, Striker, and Firing Pin.

Remove the keep pin of the breech mechanism lever hinge bolt, and withdraw the hinge bolt, when the breech mechanism lever, guide block with firing lever, and striker can be removed. Slide the firing pin out of the striker.

Breech Screw, and Retaining Catch.

Press in the catch retaining breech screw clear of the recess in the screw and unscrew the latter (to the right) from the carrier. Withdraw the retaining catch with spiral spring.

Firing Hole Bushes, Marks I and II.

(*This will only be carried out by an Armament Artificer.*)

Unscrew the bush from the interior of the breech screw by means of the special wrench. In the case of Mark II bushes, care must be taken to first remove the fixing screw for the bush in the breech screw.

Carrier.

Remove the keep pin of the carrier hinge bolt, and withdraw the hinge bolt and carrier.

Extractor.

Remove the keep pin of the extractor hinge bolt, and withdraw the hinge bolt and extractor.

Trigger.

Remove the keep pin and withdraw "Part I" trigger with bush, collar, and spring from the left side, and "Part II" trigger to the rear.

Striker, and Guide Block.

When removing the striker from, or inserting it into, the guide block, the safety catch in the latter must always be in the firing position.

Striker, Main Spring, etc.

Press on the top of the spring guide so as to slightly compress the main spring, and at the same time tilt the upper end of the guide from the striker, and withdraw the guide and main spring. Slide the firing pin out of the groove in the front end of the striker. Remove the pin securing rebound block, and withdraw the latter.

Safety Catch, Guide Block.

Place the safety catch in the firing position, and force it out of its recess in the guide block towards the centre of the block, and withdraw it.

To Replace Fittings.

The fittings are replaced in the reverse order.

When inserting the breech screw in the carrier, care must be taken, before commencing to screw in, to hold the breech screw "square" against the face of the carrier with one of the threaded portions of the screw uppermost, the stamping on the screw being to the rear. Two and one quarter turns of the breech screw are required in screwing in, the retaining catch being pressed in clear of the recess in the screw during this operation.

When inserting the trigger, first correctly assemble the spring with the projecting ends in the holes for their reception in the "Part I" trigger and brush, then insert the collar on the trigger with the recessed portion innermost, and twist the bush on the trigger until the projection on it engages with the recess in the collar. Insert "Part I" trigger with bush, collar, and spring into the left side of the gun, and engage with "Part II" trigger inserted from the rear. Insert keep pin.

CARE AND PRESERVATION OF GUN AND FITTINGS.

See also "Regulations for Magazines and Care of War Matériel."

Special Instructions not in above-mentioned Regulations.

Care should be taken that the striker is kept in good working order. The protrusion of the striker through the firing hole in the breech screw should be between ·11 inch maximum and ·09 inch minimum. A gauge for measuring the protrusion is provided, and should be used as follows:—

Open the breech, swing the breech screw and carrier into the loading position, and remove the striker. Take out the main spring from the striker and re-assemble the latter. Replace the striker (without main spring) in position in the gun, press in the "catch retaining breech screw," and revolve the breech screw in the carrier until it is in the position it would be for firing if the breech were closed. Press the striker forward in the breech screw as far as it will go, and apply the gauge to the front face of the breech screw. In the event of the protrusion not being within the above-mentioned limits, the firing pin must be adjusted or exchanged.

The breech fittings, and also the guides on the jacket by means of which the gun slides in the cradle of the carriage, should be kept clean and oiled or greased, and maintained in good working order; all working surfaces must be well lubricated, the fittings being taken off sometimes for this purpose, especially after firing.

Lubricating holes are prepared in the upper side of the carrier to admit of the rear end of the breech screw in the carrier being oiled. The holes are closed against the ingress of dust by means of a brass plunger and spiral spring, which must be pressed down by the spout of the oil can when lubricating.

All fittings of the gun should be treated with care; violence and jerks should be avoided, and no unnecessary force should be employed.

In the event of the striker recess in the breech screw becoming burred, the burrs will be removed by the use of the "Rimer, breech screw" as follows:—

Remove the breech mechanism lever, striker guide block, firing lever, and striker from the gun. Insert the cutter end of the rimer into the striker recess in the breech screw, placing the guide block on the holder in the recess for striker guide block in the carrier. Revolve the cross handle to the right and press the rimer into the striker recess in the breech screw as far as it will go. This service should only be carried out by an Armament Artificer.

Care must be taken when cleaning the striker, or when assembling the tripping piece in the striker, that no unnecessary force is used, so that the flat spring is not distorted.

The breech fittings should work easily, and be free from cracks and burrs. The latter can be removed by filing, but this must be done carefully so as not to permanently damage the fitting. Should a crack be observed in a breech fitting, it should be exchanged if possible.

The threads of the breech screw should be free from burrs.

The breech should be kept covered up, if possible, to prevent dust and grit from getting into the interstices of the breech fittings, which might impede their easy working. A waterproof canvas cover is provided for the purpose.

A gauge testing clinometer plane and axis of bore is provided for use of inspecting officers.

The gauge consists of a hollow mandril prepared on the exterior with two conical collars, and a plane for clinometer. Fitted to one of the collars is a bronze expanding bush with nut, actuated by means of a screw with friction collar passing through the centre of the mandril, so arranged as to retain the gauge in a central position in the bore when the bush is expanded. An additional expanding bush, and an adapter cylinder for use with the mandril in Q.F. 18-pr. guns are provided with the gauge. The expanding screw is revolved by means of a wrench.

A gauge plug bore low limit for provisional condemnation is provided for use of Inspecting Officers to save time and to avoid unnecessary measurements.

The gauge consists of a cast-iron cylinder having a handle formed at one end to facilitate insertion into the bore. A hole is made through the handle for the attachment of a line for pulling the gauge through the bore.

DESCRIPTION OF CARRIAGE, LIMBERS, AND WAGONS

Carriage, field, Q.F. 18-pr., Mark I.
Limber, Q.F. 18-pr., carriage, Marks I and II.
Limber, Q.F. 18-pr., wagon, Marks I and II.
Wagon, ammunition, Q.F. 18-pr., Marks I and II.
Wagons, G.S., Marks IX to X*.

Carriage.

(Plates V to XI.)

The carriage is constructed to allow of 16 degrees elevation and 5 degrees depression being given to the gun, which recoils axially in a cradle, the latter being fitted with a hydraulic buffer (to limit the

recoil), and running out springs (to return the gun to the firing position). The carriage is also constructed so that the elevation of the gun can be altered without interfering with the line of sight. It is provided with a seat on each side of the trail for two of the gun detachment, and with a shield for the protection of the numbers serving the gun, attached to the top of which is a bracket to receive a dial sight for indirect laying.

The principal parts of the carriage are:—

Trail.	Range gear.
Carriage body.	Brake gear.
Cradle.	Traversing gear.
Hydraulic buffer.	Firing gear.
Running out springs.	Shield.
Elevating gear.	Sights.

Trail.—The trail is tubular, and is secured to the underside of the axletree by a bracket, which also forms a pivot for the carriage body. The rear end is fitted with a spade, lifting handles, trail eye, and a traversing lever, which can be folded down and held by a spring clip when not in use. The trail is further supported by a tensile stay on each side, one end of which is attached to the axletree by a bracket. Fittings are provided on the right tensile stay, so that the fuze indicator can be attached if required.

Carriage Body.—The body, which is attached to the trail, consists principally of two triangular-shaped frames connected by transoms, and provided with bearings, through which the axletree passes and by which it is pivoted for traversing.

Cradle.—The cradle is of bronze, with trunnion arms to pivot it to the carriage body; it has an opening in the lower portion for the gun and in the upper portion for the spring case. Longitudinal recesses are cut in the inner surface of the lower portion for the reception of the guides on the jacket of the gun. A steel guard is fitted to the left side to protect the gun layer, and a notch and point are formed above the spring case for rough laying.

Hydraulic Buffer and Running out Springs (Plate VII).—The hydraulic buffer (which is contained in the spring case in the upper portion of the cradle) consists of a cylinder, piston, piston rod, controlling plunger, and stuffing box with gland. The cylinder is closed at the rear by the controlling plunger and at the front by the stuffing box and gland, which are locked in the required position by a spring bolt. The gun is attached to the cylinder and secured by two nuts. A number of longitudinal grooves of varying depth are formed on the inner surface of the cylinder, so that the space for the flow of the liquid between the piston and the cylinder varies during recoil; by this means an approximately constant pressure is maintained in the buffer throughout the stroke. The front end of the piston rod is fixed to the front of the spring case. The rear end is bored for the reception of the controlling plunger, which, by displacing the liquid inside the piston rod, brings the gun gently to rest when returning to the firing position.

A filling hole, closed by a plug with chain, is provided at the rear end of the cylinder.

The running out springs surround the hydraulic buffer cylinder, and are enclosed by a steel case which is screwed into the cradle above the gun. They consist of two sets, inner and outer, which are held under initial compression; each set is divided into four sections,

separated by parting plates; the inner and outer sets are also separated longitudinally by an inner case. (For limits of permanent set, see p. 29.)

On firing, the buffer cylinder recoils about 41 inches with the gun, which is checked by the action of the buffer and springs, and the latter are further compressed; the energy stored up in the springs returns the gun to the firing position.

The buffer contains about $4\frac{1}{2}$ pints of mineral oil. (See also p. 29 as to alternative liquids for cases of emergency.)

Elevating and Range Gears (*Plate VIII*).—The gears are so arranged that the elevation of the gun can be altered without altering the line of sight. The hand wheel on the left of the carriage is for aligning the sight on the target (the range indicator remaining stationary), while the hand wheel on the right side is actuated until the required range is indicated on the yard scale ring (the sight remaining stationary).

The range indicator is fitted to the right side close to the hand wheel, and consists of a yard scale ring graduated in hundreds of yards to 6,300 yards; the periphery of the ring is graduated up to 16 degrees, with readings for every 10 minutes.

Brake Gear (*Plate IX*).—The tire brake, which can be used as a recoil brake, or when travelling, consists principally of two curved brake arms, two cranked levers, connecting rods, and an actuating screw. The brake arms are pivoted at one end to a bracket on the trail, and provided at the other end with the service cast-iron brake block which acts on the wheels. A wooden seat mounted on a steel bracket is clamped to each arm between the trail and brake block. Each of the cranked levers is pivoted to brackets on the axletree, one on each side of the carriage body; one arm of each lever is connected in front of the axletree by a connecting rod; the outer arm of the right hand lever is provided with a nut through which the front end of the actuating screw passes, the other end being linked to the right brake arm. The outer arm of the left hand lever is attached to the left hand brake arm by a connecting rod and eccentric link; a releasing lever, with an eccentric pivoted to the rod and link, enables the brake to be quickly released when required. The lever is secured when travelling by a strap of the quick release pattern. The present form of curved brake arms will, as they become unservicable, be replaced by arms having straight tubes and a modified form of seat bracket.

The brake arms are actuated from the right front of the carriage (outside the shield) or from the right rear of the carriage by means of a cross handle.

Traversing Gear (*Plate X*).—The traversing gear consists principally of a crosshead, link nut, and an actuating screw with a hand wheel. The crosshead is pivoted vertically to the traversing bracket in which the rear end of the carriage body slides. The working parts are protected from the ingress of dust, &c., by cotton packing packed round the outside of the link nut. The nut is linked to the carriage body, and by means of the hand wheel on the end of the screw four degrees of traverse right or left can be obtained. A scale strip and pointer indicate the angle of traverse. A strap, attached to the left tensile stay, is used to prevent the hand wheel from turning when travelling.

Firing Gear.—The firing gear is arranged so that the sighting number can fire the gun without altering his position when laying. It is attached to the left side of the cradle, and consists principally of a

connecting rod, connecting arm, and a spring lever, which engages with the trigger of the gun. The connecting arm is pivoted to a fulcrum on the cradle at one end; the other end is connected to the spring lever by the connecting rod, which is provided with a handle for operating the gear. After firing, the handle is returned to the forward position by a spring attached to the lever and the guard protecting gun layer.

The gun can be fired when within 2 inches from the "run up" position.

Clamping Gear (*Plates VIII and X*).—The gear is provided to clamp the cradle to the carriage body in the travelling position. A spindle with clutches and handle is fixed to the carriage body, so that when the rear of the cradle is depressed to its full extent, in elevating the gun, the clutches may be made to engage with semicircular shaped lugs formed on the underside of the cradle, and rigidly fix the cradle to the carriage. This gear also determines the point of maximum elevation.

Shield.—The shield is of steel, strengthened by wooden slats. It is in two parts, upper and lower. The upper portion is attached to the axletree by supporting brackets, and to the trail by a flange with bolts. The lower portion is hinged to the upper, and hangs vertically during firing; for travelling, it is secured to the underside of the trail by a pawl with a releasing lever and locking pin. Fitted to the top of the shield is a pair of sight edges, from between which a rough estimate of the field (which can be covered by the traversing gear) can be formed by the number at the traversing lever, who, if standing directly behind it, and looking over the top of the shield between the two sight edges, will have a field of view equal to the traverse obtained by the traversing gear. Leather cases and fittings are provided for carrying a dial sight, field clinometer, sight clinometer, telescope, aiming posts, breech and muzzle covers, fuze keys, fuze setter, and an oil can. An advance ring is fitted to the centre of the shield.

Sight, Rocking Bar (*Plate XI*).—The rocking bar sight consists principally of a rocking bar and a sight bar. The rocking bar is pivoted horizontally at the front end to an arm on the left trunnion of the cradle. A bracket is riveted to the underside at the rear end to carry a sight clinometer. An open square socket is formed in the bracket for the reception of a similar shaped projection on the arc bracket of the range gear, by which the reciprocating motion of the elevating screw is conveyed to the bar. The rear end is provided with a crosshead with a traversing screw with milled heads, and a nut which enables 5 degrees of deflection right or left to be given to the sight bar. Degrees of deflection are marked on a scale plate, and minutes in multiples of 5 on a ring fixed to each of the milled heads of the traversing screw.

The sight bar is pivoted vertically about the centre to a socket with an adjustable bush in the rocking bar. The rear end of the bar is fixed to the traversing nut. Two holders with caps secured by spring clamps are fitted to the bar to carry a "telescope, sighting, No. 4." The rear holder is fitted with a notched leaf hind sight, and the front end of the bar with an adjustable acorn-pointed fore sight. A cap is provided for the protection of the sight. The rocking bar sight is removable, being attached to the trunnion arm by a securing key with a chain.

The permanent angle of deflection for drift is given by the axis of the trunnion cradle being inclined at an angle of 1½ degree, the left

trunnion being the lower, so that as elevation is given the gun muzzle moves to the left the necessary amount to correct for drift.

Sight Clinometer (Plate XI).—The sight clinometer is used to give the "angle of sight," and admits of 20 degrees elevation or 20 degrees depression. It is constructed so that it may readily be attached to the rocking bar sight. It consists principally of a cradle with a worm spindle, and a toothed arc with a spirit level. The cradle is fitted on the underside with spring clips for fixing it to the rocking bar, and with radial grooves on the top, in which the arc slides; the worm spindle passes through the centre of the cradle, and is supported at each end by movable bearings, one of which is pivoted to the cradle, and the other free to slide in grooves for a limited distance, so that the worm on the spindle may be readily disengaged from the teeth in the arc when necessary for quick adjustment. The worm is kept up to its work by a flat spring with a bearing surface on its underside, and each end of the spindle is fitted with a micrometer collar marked to read minutes in multiples of 5. The arc consists of a toothed segment with a spirit level above; it slides in the grooves on the cradle, and the teeth engage with the worm on the spindle; an adjustable pointer is fitted below the level for reading the degrees of elevation and depression engraved on the cradle.

Axletree.—The axletree (2nd class "C" No. 205) is a tubular steel forging; it is connected to the trail by three brackets, the outer brackets being recessed on the outer faces for the reception of an L-shaped leather ring, which is secured by a steel plate. The L-leather envelops the inner end of pipe box, and prevents the ingress of dirt, dust, &c. The outer end of each arm is fitted for a linch pin and an adjusting collar, which has a number of recesses (through which the linch pin passes) cut in one face; the recesses are of varying depths, from ·2 inch to ·5 inch, increasing by ·05 inch, so that any reduction in the length of the pipe box, due to wear, may be adjusted.

Wheels. — The wheels are 2nd class "C" No. 45, 4 ft. 8 in. diameter, with steel nave, removable pipe box, and a 3-inch steel tire with rounded edges. The nave consists of two flanges of corrugated steel, which are connected by bolts. The inner flange is fitted with a steel ring to strengthen it, and the outer flange with a centering ring. The pipe box passes through the centre of the flanges, and is secured by a nut, which is prevented from working loose by a flat spring which is fixed to the pipe box and engages with one of a number of indents on the rim of the nut. A dust cap is screwed on the outer end of the pipe box; it encloses the adjusting collar, linch pin, and the end of the axletree arm. The inner face of the cap is recessed for the reception of a corresponding projecting ring on the nut, the cap being secured to the nut by a split keep pin. The pipe box is provided with a lubricating hole, which is closed with a ½-inch screw.

The drag washer is free to revolve round the nut, and is secured by the dust cap.

On an emergency, a 2nd class "C" No. 200 wheel may be used to replace a No. 45 wheel, in which case the adjusting collar and linch pin for capped wheels may be used, the linch pin being secured by a piece of wire or a leather lace. In place of the adjusting collar and linch pin, the ordinary 2nd class drag washer and linch pin can, if desired, be used.

When using No. 200 wheels which have not had the inner flange

reduced in diameter, the dust excluder (L-leather with keep plate) must be first removed.

Tool Case.—A leather tool case for spanners and tools is carried above the axletree on the right side of the carriage, and is secured to the axletree by two supporting brackets with bolts. For contents, see Packing Diagram A.

† LIMBER, Q.F. 18-PR., CARRIAGE, MARKS I AND II.

(*Plates XII and XIII.*)

The limber consists of a steel frame, a limber hook, a second class axletree, draught fittings, an ammunition box, and two field wheels.

The frame consists of four futchels, connected at the front end by a plate, and at the centre by stays. Platform and foot boards are fitted to the top, and draught hooks for the swingletrees to the front of the outer futchels. A steel limber hook, No. 26, is riveted to the rear end of the inner futchels.

The axletree, No. 208, is of weldless steel tube; it is fixed by flanges to the futchels. The linch pin and adjusting collar are the same as for the carriage.

The fittings for draught consist of a No. 17 Mark III pole, a No. 3 supporting bar, and two No. 11 swingletrees. The pole and bar are for use with the R.A. pole draught breast harness. The pole is 12 feet 4½ inches in length over all; the front end is protected by steel wrapping plates; a U-shaped tug is passed through the pole from the underside and secured by a nut on the top. The tug forms a stop for the pole bar, and its position from the point of the pole may be varied from 14½ inches to 29½ inches, in distances of 3 inches, according to requirements. The pole bar is 3 feet 9½ inches in length, fitted at the centre with a circular loop, which is formed to pass over the front end of the pole and butt against the tug. Two links are fitted on each side of the loop, by means of which the bar is attached to the neck piece of the harness. The swingletrees are 2 feet 6 inches long.

The ammunition box is of steel, and opens at the rear; it is constructed to carry 24 rounds of "fixed" ammunition, is fitted with guard irons, Nos. 25 "near" and 26 "off," is secured to the frame by rivets, and supported by side connecting plates and gusset plates. Internally it is fitted with 24 tubular baskets, or brass tubes fixed horizontally. A compartment is formed in the centre for two wood trays for small stores. The lid (the inside of which is covered with a leather pad to prevent the ingress of water) is hinged to the bottom of the box, and is provided with a shield plate of the same width, which hangs vertically below the lid when opened. The shield plate is hinged to the lid, and, when closed, the former is folded over the latter, which is secured by catches on each side of the box. Fittings are provided on the top of the ammunition box so that the "indicator, fuze," can be attached if required.

Spring clips are attached to the front of the box for carrying two rifles, which are secured in position by means of "quick release" securing straps and protected by a canvas cover.

The limber is fitted on the underside with wire nut receptacles for carrying canvas water buckets, with fittings to carry a 3-lb. grease tin

† The Mark II limbers and wagons differ from Mark I only in being fitted with tubular baskets instead of brass tubes for carrying the cartridges.

and two No. 3 lubricating cans (one for Rangoon and one for buffer oil); also various stores as shown in Packing Diagram A.

The wheels are the same as those described for the carriage.

Half the limbers per battery will be fitted with loops for kicking straps.

† Limber, Q.F. 18-pr., Wagon, Marks I and II.

(Plates XIV and XV.)

The wagon limber differs from the carriage limber principally in the form and capacity of the ammunition box, which is constructed to carry 38 rounds, and one tray for small stores. It is provided at the rear with three lids, one on each side, and one in the centre. The side lids are fitted with shield plates, and hang below the limber frame, as in the carriage limber; the centre lid is hinged at its upper edge, and rests on the top of the box when open. Fittings are provided on the top of the ammunition box so that the "indicator, fuze," can be attached if required. The wheels are 2nd class "C" No. 43, and are of lighter construction than the No. 45 for the carriage and carriage limber.

† Wagon, Ammunition, Q.F. 18-pr., Marks I and II.

(Plates XVI and XVII.)

The wagon consists of a steel frame, a hollow box perch fitted with a perch eye, a steel ammunition box, a brake gear, a 2nd class axletree, and two field wheels.

The frame consists of two flanged sides connected by stays; platform and foot boards are fitted to the sides and perch in front, and a shelf is fitted under the platform board on each side of the perch to carry a 14-lb. grease box.

The perch, which is connected to the frame by the side stays and platform boards, is plugged at the front end with hard wood. It is fitted with locking plates and a No. 13 perch eye.

The ammunition box is the same as for the wagon limber, with a shield plate similar to that for the carriage limber.

A tire brake is provided, which acts on the front of the wheels and is actuated from the rear by a hand wheel.

The wagon is fitted to carry a spare jointed pole and the various stores as shown in Packing Diagram B.

The axletree is 2nd class "C" No. 208. The wheels (No. 43) are the same as for the wagon limber.

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† See footnote †, page 15.

DIMENSIONS, &c.

	Carriage and Limber.		Ammunition, Wagon, and Limber.	
	ft.	ins.	ft.	ins.
Height to axis of gun	3	0·86		—
Height to line of telescope	3	8·01		—
Height to line of sight	3	9·11		—
Height maximum carriage, with dial sight..	4	11·4		—
Height maximum carriage, without dial sight	4	8·75		—
Height maximum limber	4	9		—
Height maximum wagon and limber ..		—	5	2
Width, maximum	6	3	6	3
Length of carriage with gun	13	8		—
Length of limbers carriage with pole ..	14	2		—
Length of limbers carriage without pole	5	4·5		—
Length of limbers wagon with pole ..		—	14	2
Length of limbers wagon without pole		—	5	4·5
Length of wagon		—	8	5
Length between axletrees	9	11	7	4·75
Length with pole (end of pole on ground) ..	27	4·5	21	5·5
Length without pole	18	9	12	11
Greatest projection beyond track of wheels ..	—	6	—	6
Wheels track	5	3	5	3
Wheels height	4	8	4	8
Space required to turn in	32	0	28	0
	deg.	min.	deg.	min.
Angle of lock	71	0	64	0
Angle of trail (spade buried)	14	18		—
Upsetting angle	39	30	35	30
Elevation, maximum	16	0		—
Depression, maximum	5	0		—

AVERAGE WEIGHTS.

(Fully packed with ammunition and stores, but without men or personal equipment.)

	Weights.		
	cwt.	qr.	lb.
Carriage with gun..	24	3	21
Limber carriage..	15	0	23
Limber wagon	17	3	26
Wagon, ammunition with spare jointed pole.. ..	18	3	0
Wagon, ammunition without spare jointed pole ..	18	1	0
Carriage and gun with limber	40	0	16
Wagon, ammunition and limber with spare jointed pole	36	2	26
Wagon, ammunition and limber without spare jointed pole ..	36	0	26

AVERAGE WEIGHTS—*continued.*

(Fully packed with ammunition and stores, but without men or personal equipment.)

			Weights.		
			cwt.	qr.	lb.
Carriage and limber	weight on fore wheels ..	..	16	0	8
	weight on hind wheels ..	..	24	0	8
Wagon, ammunition and limber	weight on fore wheels with spare jointed pole ..	..	19	1	22
	weight on hind wheels with spare jointed pole ..	..	17	1	4
	weight on fore wheels without spare jointed pole ..	..	19	0	3
	weight on hind wheels without spare jointed pole ..	..	17	0	23
Weight on pole at tug 3rd hole from front end (limbered up)	carriage and limber	without men ..	—	—	24
		with 2 men on limber ..	—	1	4
	wagon and limber	without men ..	—	—	20
		with 2 men on limber	—	1	0
Carriage—					
Pressure of trail on ground ..	..	..	1	0	8
Pressure of trail on limber hook	..	..	—	3	4
Wagon, ammunition—					
Pressure of perch on ground	with spare jointed pole ...	..	1	3	16
	without spare jointed pole	..	1	3	4
Pressure of perch on limber hook	with spare jointed pole	..	1	0	20
	without spare jointed pole	..	1	0	0
Wheel, 2nd Class "C"	No. 43 ..	..	1	2	10
	" 45 ..	..	1	3	10

Dial Sight, No. 1, Marks I* and II.

(*Plate XVIII.*)

The dial sight consists of a circular carrying plate with degree scale ring, a crosshead and pin, and a sight plate with pointer. The carrying plate is hinged at the centre to the crosshead, and the crosshead is hinged transversely to the crosshead pin. This arrangement admits of an adjustment right and left to compensate for any difference that may occur in level of the wheels, and for elevation or depression being given to the plate and sight. The degree scale ring is fixed to the periphery of the carrying plate by screws; it is marked in degrees, 180 on each side of zero, and each degree is divided into 20, the required angle being read by means of a pointer fixed to the rear end of the sight plate. Should it be found by examination that when the sight line and axis of the gun are parallel, 0° is *not* indicated, the pointer is so formed as to admit of the required adjustment being made. The sight plate is pivoted to the centre of the carrying plate and jointed near its centre; the joint pin is provided with a thumb nut for clamping the plate in the extended or folded position; the plate is fitted with an acorn pointed fore sight at the front end, and notched to form a hind sight at the rear end. A clamping screw is provided to fix the sight plate at the required angle. The sight is fixed to the bracket by the crosshead pin, which fits into a corresponding socket, and is secured by a keep pin.

INDICATOR FUZE, Q.F. 18-PR.

(Plate XIX.)

The fuze indicator is used to indicate the required setting of fuze for any range, and can be attached either to the ammunition wagon, limbers, or the right tensile stay of the gun carriage as required. The indicator will not be carried on the carriage during travelling. It consists principally of a yard scale ring and fuze scale plate, one within the other, and a fixed pointer, the whole being pivoted centrally to a hinged bracket, and protected by a leather case. When required for use it is withdrawn from the case and swung into the erect position, so that it may be readily seen from the rear of the vehicle. The plate and ring may be turned together or independently of each other.

The fuze scale plate is graduated on its outer edge with a fuze scale reading from 2 to 22, each division being further subdivided into 10 divisions.

The yard scale ring is marked on its outer edge with a scale reading from 600 to 6,200 in divisions of 50 yards. A portion of its inner edge is graduated with a fuze corrector scale reading from 0 to 300, each division representing 2, whilst the larger divisions, which are numbered, represent 10; the angle subtended by each large division of 10 is equal to the angle between 2,900 and 3,000 yards, so that to correct for 100 yards at the 3,000 yards range the fuze scale plate has to be moved 10 on the corrector scale. The normal position (*i.e.*, no correction) is indicated when the arrow on the fuze scale plate is opposite to 200 on the corrector scale. It is the essential character of this indicator that correction once arrived at for any one range will be sufficiently accurate for all ranges under like conditions.

When a range is ordered, both ring and plate are turned until the range is opposite the pointer, the length of the fuze being, at the same time, indicated by the *inner* reader of the pointer.

When a correction is ordered, the fuze scale plate is turned independently of the yard scale ring. If the correction is small, the required movement may be obtained by manipulating the adjusting screw, but if a large correction is ordered, the clamping screw is released and the fuze scale plate moved to the approximate position by hand; the clamping screw is then tightened, and the final adjustment made by means of the adjusting screw.

The fuze setting obtained by means of the indicator gives a period of burning slightly less than that shown on the range table, the fuze scale being calibrated to "point of burst" and not to target.

TELESCOPE, SIGHTING, NO. 4, MARK I.

Particulars.

Magnification	$5\frac{1}{3}$ diameters.
Field of view	$5\frac{1}{2}$ degrees.
Length over all	17·25 inches.
Weight	2 lb. 12 oz.

Description.

The telescope is of the ordinary erecting type, with an object glass and terrestrial eyepiece.

The body is fitted with two gunmetal collars, which accurately fit the bearings on the sight bar; the rear collar has a small projecting pin, which prevents the telescope from turning in the bearings.

The eyepiece is fitted with a metal eye guard, and a diaphragm carrying a needle-shaped pointer is fixed at the focal length of the object glass. The eyepiece also carries an engraved ring numbered 0 to 7, which in conjunction with an arrow on the body, registers the turning movement of the eyepiece, 4 being the position for normal vision, so that individual layers may set their focus to the figure previously determined.

The object glass is fixed in the correct position for infinite focus, or, in other words for all objects over 400 yards distant. It is protected by a ray shade.

Two caps connected by a sling are provided to protect each end of the telescope; the sling is attached to the body of the telescope by a small strap with buckles.

Mark II.

Mark II differs from Mark I in the diaphragm which carries the pointer being made adjustable, so that collimation may be carried out by means of the diaphragm, instead of by rotating the object glass in eccentric rings.

To focus the Telescope.

The telescopes are issued with the object glass fixed at its point of infinite focus, and is then suitable for all distances over 400 yards; it therefore only remains to focus the pointer with the eyepiece. To do this, place the telescope in its bearings, put on the caps, and fix the clamps. Direct the telescope on a well-defined object, preferably about 1,000 yards or more distant.

Screw the eyepiece in or out until the pointer stands out clearly; the object will then stand out clearly at the same time.

Care of Telescope.

The telescopes are issued with all cells, joints, &c., tightly screwed up. The glasses should not be unscrewed except in cases of necessity, and then only by a competent person; they will seldom require to be cleaned on the inside. Cleaning should be done only with chamois leather, and great care must be taken that no oil or grease touches the glasses, as it can only be completely removed by the use of spirit.

If the object glass is unscrewed for cleaning purposes, the lenses should not be removed from the cell, as they may be easily re-assembled incorrectly. The unscrewing of the object glass cell causes defective collimation, rendering the telescope useless, and necessitating re-collimation.

The focussing tubes should on no account be removed by any but a skilled person, specially appointed to do so.

The body of the telescope must not be cleaned or polished with anything except a dry cloth and a little oil or vaseline, care being taken that the lenses do not come in contact with any greasy substance. Even fingers, when apparently perfectly clean and dry, may leave greasy marks on the lenses which will impair the definition of the telescope more than dust.

General Remarks.

Telescopes as issued from Woolwich are tightly screwed up and accurately collimated, and provided that none of the screw threads are unscrewed or tampered with, the collimation will remain as good as when first adjusted.

APPARATUS, ADJUSTING RUNNING OUT SPRINGS, Q.F. 18-PR., MARK I.

The apparatus consists of a steel screw with locking nut, clip, and actuating nut with handle. The method of attaching the apparatus to the hydraulic buffer is as follows:—

(a) Insert the V-screw thread on the screw into the hole for its reception in the rear end of the controlling plunger as far as it will go (care being taken that the locking nut is screwed back against the collar on the screw), and tighten up the locking nut against the face of the plunger.
(b) Place the clip over the screw, and insert the two studs into corresponding holes in the rear of the spring case.
(c) Screw the actuating nut with handle against the rear end of the clip.

FUNNEL, FILLING HYDRAULIC BUFFER, MARK II.

The funnel, which is of leather, is for use in filling the cylinder of the hydraulic buffer.

SYRINGE, Q.F. 13 AND 18-PR., MARK I.

The syringe is for extracting liquid from the hydraulic buffer (*see* Care and Preservation, page 27).

TOOLS, PACKING GLAND, Q.F. 18-PR.—

COLLAR, MARK I.

PLUG, MARK I.

The collar and plug are for use in packing the stuffing box of the hydraulic buffer.

The collar is for assisting the asbestos packing ring over the shoulder of the piston rod.

The plug is for removing the packing and supporting rings, and packing washers, from the stuffing box.

TOOL, WITHDRAWING RING SUPPORTING PACKING, Q.F. 13 AND 18-PR., MARK I.

The tools are for withdrawing the outer ring supporting packing from the stuffing box of the hydraulic buffer.

INSTRUCTIONS FOR TESTING AND ADJUSTING THE SIGHTS.

Any adjustments required must be carried out by an Armament Artificer.

TELESCOPE.

Mark I Telescope.—There is no internal adjustment provided for the Mark I telescope (except during manufacture); it is therefore less likely to get out of adjustment, and there are no small internal screws to be manipulated. To obviate any small error left in the telescope during manufacture, the rear collar is provided with a pin to prevent the telescope being turned round in its bearings, and the small error is taken up by adjusting the fore sight.

Mark II Telescope.

Collimation.

Test.—Place the telescope in its bearings. Lay the pointer on some well-defined object. Release the hinged caps. Remove telescope and replace it, but with its pin uppermost. The tip of the pointer should remain on exactly the same point.

Adjustment.—If, when the telescope has been turned, the tip of the pointer appears to have moved *above* the point layed on, unscrew the capstan-headed screw beneath the telescope (having previously unscrewed the metal cap covering the capstan-headed screws), and screw up the one above the telescope until the pointer is brought half way towards the point layed on, thereby depressing the sight; move the pointer exactly on to the point layed on. Repeat the process until the pointer moves neither above or below the point layed on.

If the pointer appears to have moved *below* the point layed on, reverse the above procedure.

Should the pointer move to either side of the object when the telescope is reversed, it may be corrected in a similar manner.

See that all the capstan-headed screws are home, and replace the metal protecting cap.

ALIGNMENT TESTS.

Before any of the following operations are carried out, the carriage should be placed on a firm platform, or on hard level ground, and manipulated until the gun is level both longitudinally and transversely. If these arrangements cannot be conveniently made, the base line of the target (*Plate XX*), if used, must be set parallel to the slope of the wheels.

Place the testing bush (one of which is allowed per battery) in the muzzle end of the bore, and lay the gun by sighting through the firing hole in the breech screw and the pointers of the testing bush (the striker having previously been withdrawn). If the testing bush is not available, a point at the muzzle may be obtained by stretching two fine cords along the vertical and horizontal axis lines cut on the muzzle of the gun.

Select a clearly-defined object, at least a mile away, to lay on; or, if this is not available, construct a target with three circles on it, B, T, and S, each circle divided into black and white sectors, the centres of the circles being the points to lay on (*see* Plate XX). Set the target up at a distance of about 50 yards from the gun. Lay the axis of the gun on point B.

Open Sights.

(1) *The line of sight through the open sights should be parallel to the telescope.*

Test.—Lay the telescope, by means of the elevating and traversing handles, on the left side of the trail, on the point "T." The open sights should now be found to be on "S"; if not so, the *vertical* error can be corrected.

Adjustment.—Loosen the fixing screw below the fore sight, and screw up or down the acorn of the fore sight until the line of the open sights is on "S." Then tighten up the fixing screw.

The transverse error between the telescope and the open sights cannot be adjusted without bending the sight bar, an operation which

is not recommended unless absolutely necessary. This error is, however, not important, and is not likely to be large.

(2) *The yard scale ring should be at zero when the axis of the gun and the sights are parallel.*

Test.—Set the deflection scale at zero, and lay the telescope, the open sights, and the bore, on the points T, S, and B respectively. The bore and the sights are now directed on the same target, and the yard scale ring should read zero.

Adjustment.—Remove the split pin on the end of the spindle. Slack back the nut about four turns until the ring is free. Then turn the ring until the zero coincides with the pointer, and screw up the nut by hand; but before tightening up with the spanner, take another look down the bore and through the sights to see that neither have shifted off their respective points. This is the most important test, and the only one which is likely to be often required, and it is the easiest to carry out.

(3) *The deflection scale should be at zero when the axis of the gun and the sights are parallel.*

Test.—Set the yard and deflection scales at zero, and lay the bore of the gun on the point B. The sights should now be on T and S.

Adjustment.—Loosen the clamping pin which passes through the pivot in the centre of the sight bar. It will sometimes be necessary to loosen the nut below the pivot also. Then with the spanner provided for the purpose, turn the adjusting bush in the pivot until the sights and the telescope are directed on their respective points; or, if there is any transverse error between them as found in (1) above, until this error is equally divided between the open sights and the telescope. Tighten up the nut and clamping pin, and replace the split pins.

Clinometer Sight.

The bubble of the clinometer should be in the centre of its run when the yard scale ring reads zero and the axis of the gun is horizontal.

Test.—With the handle on the right side of the trail, elevate the gun until the yard scale ring reads zero. Place a Mark III field clinometer accurately set at zero on the clinometer plane of the gun, and with the elevating handle on the left side of the trail, elevate or depress the gun and sights together, until its bubble is in the centre of its run. The bubble of the sight clinometer should now be in the centre of its run.

Adjustment.—Turn the worm spindle of the clinometer until the bubble is central; then loosen the screws securing the indicator plate, and slide the plate until the indicator reads zero. Carefully tighten the securing screws, making sure that the indicator is not again moved. Next observe the zero of the micrometer collar at each end of the worm spindle, and if any error is apparent, loosen the securing nuts with the spanner provided for the purpose (No. 244), turn each micrometer collar till its zero is correct, and re-tighten the nut.

Wagon, General Service, Marks IX to X*.

The Mark IX wagon consists generally of the following parts: body, under carriages, seat, floating raves, brake, axletrees and wheels. It is fitted with a 4-inch roller scotch, whip socket, and two grease boxes.

The body is separate from, but rests on, front and rear under carriages. Allowance is made on the front carriage for slight longitudinal motion, to ensure flexibility to the vehicle for rough travelling. The rear under carriage has two straight guides, which are continued slightly beyond the body.

A locker is formed on the front part of the wagon; the locker is bevelled off to allow the fore carriage to have a greater sweep, and thus minimize the space in which the wagon can turn.

The wagon is fitted for pole draught, which consists of a No. 7A pole, and two No. 10A or 11 swingletrees.

The splinter bar is strengthened by iron stays, which are formed with hooks at the front for the attachment of the swingletrees.

The driver's seat is supported on elliptical springs, to afford easy riding; the springs are fitted to a cross bar, with ends formed to fit over two wooden standards, and are kept from being too lively by two leather straps, the seat being fastened to the standards by keys.

The brake, which acts on the rear of the hind wheels, is applied from the driver's seat by a hand lever, or from the rear of the wagon by a handle operating a screw. The hand lever is connected by a flexible wire rope on the off side of the wagon to a lever, secured to the guides of the rear under carriage, and fitting into a loop attached to the rear axletree bed. A brake screw is connected with this lever and a wooden cross bar, which carries the brake blocks, and which is supported by brackets secured to the end of the guides. When the hand lever is pushed forward the blocks are forced against the wheels. A rack retains the hand lever in position when the brake is applied, and a spring fixed behind the lever serves to ease the blocks off the wheels when the hand lever is released.

The fore axletree is 3rd Class B, No. 174, and the hind, 2nd Class C, No. 200. The wheels are 3rd Class B, No. 159, and 2nd Class C, No. 200, being 3 feet 9 inches and 4 feet 8 inches in diameter respectively, with $2\frac{1}{2}$-inch tire.

The cover is made of waterproof canvas, and can be adjusted to suit varying heights of loads, having on the outside two rows of tabs with eyelet holes, and on the under side and the hem side lines of white rope. Brass eyelets are secured at intervals along the hem.

The cover is secured to fitments on the wagon by lashings, which should be passed through a row of eyelets on each side and on the back, according to the height of load to be covered.

The side lines of white rope on the under side are for use in reefing the cover when small loads are carried in the wagon; the four on the hem are to keep the cover clear of the wheels.

The sides and rear of the cover not required should be rolled up and stowed away inside, the front portion being stowed behind the driver's seat on full and half-loads.

Weight	16 cwt. 3 qrs. 25 lbs.
Minimum space in which the wagon can turn	39 ft.
Tonnage { for shipment	6·751 tons.
Tonnage { for transport in boats	10·112 tons.
Rectangular space occupied in boats	12 ft. 8 ins. × 6 ft. $0\frac{3}{4}$ in. × 5 ft. 3 in.

Mark X is generally similar to Mark IX, but of rougher make, and is fitted with a sweep bar. Weight, 15 cwt. 2 qrs. 17 lbs.

Mark X* is the Mark X wagon provided with dust cap wheels and fittings, Nos. 200A (hind) and 159A (fore). Weight, 15 cwt. 3 qrs. 12 lbs.

CARE AND PRESERVATION OF CARRIAGES, &c.

See also "Regulations for Magazines and Care of War Matériel."

SPECIAL INSTRUCTIONS NOT IN ABOVE-MENTIONED REGULATIONS.

(*Plates VII, IX to XI.*)

CARRIAGE.

To remove the hydraulic buffer and springs (gun in position), *Plate VII* :—

Note.—Care should be taken that no one is standing in front of the carriage while the operation is being carried out.

1. Place the gun at depression, and remove the outer nut (E) securing buffer cylinder, which will allow the cylinder to bear against the outer spring case cap (A).
2. Attach the "apparatus adjusting running out springs" to the controlling plunger (M), and take up the tension on the running out springs.
3. Remove the piston rod nut (G), the outer spring case cap (A), and filling plug (L).
4. Unscrew gradually the actuating screw of the apparatus and the inner nut (F) securing buffer cylinder (C) as the springs are released, care being taken when removing the cylinder that the filling hole is kept upright to prevent loss of oil.

To replace the hydraulic buffer and springs :—

1. Replace the rear washer (R) at the end of the outer spring case with radius to the rear, and insert the outer springs and parting plates (J) in correct order.
2. Insert the inner spring case (B), with front washer (P) (radius to the front) in position.
3. Place the rear washer (T) in the inner spring case (radius to the rear), and insert the inner springs with parting plates (K) in the correct position.
4. Place the front washer (S) on the buffer cylinder (C) (radius to the front).
5. Replace the cylinder, care being taken that the filling hole is at the top, and that the inner nut (F) securing cylinder is held in position while the cylinder is being replaced.
6. Attach the "Apparatus running out springs" to the controlling plunger (M) at the end of the cylinder, and compress the springs, care being taken that the feathers on the end of the cylinder are in the correct position to enter the featherways in the lug of the gun, and that the inner nut (F) securing cylinder is correctly secured by screwing it up while compressing the springs.
7. Replace the outer spring case cap (A) (first seeing that the split pin (H) retaining stuffing box stud, is placed in position and the point opened), care being taken to ensure that the featherway (a) in the cap engages the feather on the end of the piston rod (N).

8. Replace the piston rod nut (G), the outer nut (E) securing cylinder, the filling plug (L), and remove the apparatus.

In removing and replacing the buffer cylinder, the gun *must* be kept at depression or properly secured.

Note.—If during firing it is found the gun will not return to the firing position and remains practically at full recoil, then the inner spring case will have broken. In this case, special precautions will have to be taken when removing the buffer and springs, and are as follows:—

1. Place the gun at depression and run it up to a distance of about 45 inches from the cradle, the breech being supported on the trail on skidding.
2. The piston rod nut (G) should not be removed.
3. A check rope should be attached to the outer spring case cap (A) by means of a noose made, or a loop spliced, in the centre of the rope, leaving room for the spanner to be worked. The noose or loop should be well greased.
4. Each end of the rope must be manned while the spring case cap is being removed, so as to take the pressure of the outer springs off the front threads of the outer spring case.
5. The outer springs should then be allowed to extend to their normal condition by easing up the gun. This will take place when one spring is clear of the outer case. Care should be taken not to bend the piston rod. During this operation it will probably be found necessary to attach the check rope to the breech of the gun and haul it up; a handspike should be placed under the breech to take the weight of the gun off the cradle.
6. Remove the piston rod nut, cap, and one outer spring. Remove filling plug and the plunger controlling so as to empty the buffer. Then push the piston rod back into position.
7. The inner springs and the remaining outer springs can be removed by attaching the "apparatus adjusting springs," and the remaining operations are similar to those before detailed.

To tighten or repack gland:—

1. If any leakage of oil takes place at the gland, it should be tightened; if this will not stop the leak, the packing must be renewed.
2. To repack, remove the gland (O), withdraw the retaining ring with the tools supplied, and replace the packing with fresh material, using the metal collar of the packing tool for assisting the packing over the shoulder of the piston rod. Replace the retaining ring and gland, care being taken to ensure that a slot in the gland is in the correct position to engage the retaining stud (O).
3. Before tightening or repacking the gland, the nut (G) and cap (A) must first be removed.

Pin, keep, split, securing "stud retaining stuffing box."—On inserting and opening out this pin, care must be taken to see that the retaining stud when pushed right back clears the flange of the stuffing box to permit of its removal. The head and point of the pin should be set

to the front if necessary to clear the end of the slot and to allow the stud to go back far enough to clear the stuffing box.

To fill the buffer. (Quantity of mineral oil about $4\frac{1}{2}$ pints.)—Place the gun at extreme depression, remove the filling plug (L), unscrew the control plunger (M) two turns, to admit of the escape of air, and fill the cylinder, using the leather funnel provided for the purpose. Replace the plug (L) and tighten the controlling plunger. Great care must be taken that no dust or gritty matter is poured in with the oil. After filling the buffer, about $\frac{1}{10}$ of a pint of oil should be extracted by means of the syringe supplied for the purpose.

Elevating and range gears.—On coming into action (gun being in the housed position), release the clamping handle (A), Plate X, place the traversing pointer at 0°, and bring the gun to about the horizontal position, by means of the left elevating hand wheel. Either gears (elevation or range) can then be worked as required.

In replacing the bearings and elevating nuts, care must be taken that the open side of the bearing is inserted first in the upper gear, and the closed side first in the lower gear (with the teeth of the elevating nuts at the top in both cases), so as to ensure that the gun is always elevated by revolving the hand wheels towards the rear, or depressed by revolving the hand wheels towards the front.

Range indicator.—The yard and fuze scale should be kept perfectly clean, free from grit, burrs, or dents, and the revolving surfaces slightly greased.

In replacing the eccentric bush in the arc guide, care must be taken that the bush is placed in such a position as to ensure the least possible play between the teeth of the pinion and the elevating arc. The grooves in the eccentric bush which engage the stop pin are arranged to give 8 adjustments, which are numbered 1 to 8, Nos. 1 and 8 representing the minimum and maximum setting respectively.

A certain number of bushes have the grooves numbered 1 to 8, but Nos. 1 and 5 indicate the minimum and maximum setting respectively.

The order of adjustment for each pattern of bush is as follows :—

	Nos. 1 and 8 Minimum and Maximum.	Nos. 1 and 5 Minimum and Maximum.
1st adjustment	1	1
2nd "	2	2
3rd "	3	8
4th "	4	3
5th "	5	7
6th "	6	4
7th "	7	6
8th "	8	5

To remove the indicator.—First disconnect the rod connecting elevating screw at the arc joint, withdraw the arc until it is out of gear with the pinion, holding the spring case by the hand while doing so, gradually release the tension (by the hand) on the spring

by allowing the spring case to revolve slowly so as to prevent the breaking of the spring, and remove the indicator from the spindle.

To replace the indicator.—Remove the centre plate, washer, and yard scale ring, place the spring case on the spindle, and the spring barrel on the bearing on the cradle, turn the spring case by hand to the right until the spring is at full tension, release the spring about a quarter of a turn, and engage the arc and connecting rod; replace the yard scale ring, washer, and centre plate.

Brake gear.—When the brake is applied, the releasing lever must be housed, as at (A) Plate IX.

Any wear in the eccentric can be adjusted by screwing up the connecting bolt of the link eccentric.

When assembling the "lever, releasing brake," the hexagon on the spindle portion of the lever must be placed in the eccentric so as to give the maximum amount of throw.

Traversing gear.—The pivot of the crosshead (B) Plate X, should be kept properly nutted up, and any lateral play in the traversing screw adjusted by tightening the crosshead cap (C), and check nuts (D).

Gear clamping cradle.—Care should be taken that the handle of the clutch spindle is always against the stops when not in use.

The cradle can only be clamped when the gun is at extreme elevation. The gear is intended for use when travelling only.

In replacing the clamping gear the clutches (which are left and right) must be correctly placed on the spindle, *i.e.*, the thinnest portion of the eccentric being to the front, and both in the same relative positions on the spindle, so as to engage the bearing on the cradle at the same time.

Pin, locking shield pawl.—It should be carefully noted that this pin is always in proper position when travelling.

Wheels, Nos. 43 and 45.—These wheels are fitted with dust caps, which can be removed with a No. 93 spanner; lateral play between end of pipe box and linch pin can be adjusted by means of an adjusting collar with slots through which the linch pins pass; the slots vary in depth from ·2 inch to ·5 inch, the difference in depth between each slot allows for a wear of ·05 inch.

A linch pin of a capped wheel with the adjusting collar can be used with any ordinary second class wheel, if required.

An ordinary second class linch pin and a second class "C" drag washer can be used on an emergency, with a capped wheel, if the cap be removed.

Sights.—Great care must be taken not to damage the sights when removing or replacing. The parts of the carriage to which the sights are attached must be absolutely clean and free from burrs.

Deflection screw and nut.—Should be kept free from grit and dirt, and should be well greased, and if removed for any purpose care should be taken, in replacing, that the spring is properly compressed before entering the screw (which is in two halves, with a spring inserted between the nut to take up the wear).

Adjusting bush.—(A) Plate XI. To be kept clean and well oiled, and if removed for any purpose, steps should be taken to have the sight adjusted to the vertical plane of the gun.

Yard scale ring.—This should be kept clean and oiled, and if removed for any purpose, on replacing it should be set to the horizontal plane of the gun and sight.

Clinometer Sight.—Should be kept oiled and free from grit, and in perfect adjustment.

Capsquares.—To remove cradle capsquares for cleaning, &c., the carriage body must be traversed as far as it will go to the left to admit of the *right* capsquare key being removed, and to the right to remove the *left* key.

Bolts with nuts.—In all cases where nuts are not prevented from shaking loose by split keys, the end of the bolt should be slightly riveted over the nut after screwing up.

To remove the outer spring case from cradle:—

1. Dismount the gun.
2. Carefully remove the buffer (consisting of the cylinder, piston rod, inner and outer springs and inner spring case). *See* page 25.
3. Disconnect and remove the upper handwheel pinion of the elevating gear and the indicator pinion of the range gear.
4. Remove the upper protectors (curved) and fore sight for rough laying.
5. Unscrew the spring case (by means of a rope and a handspike or other suitable appliance). Care must be taken when the first portion of the thread of the spring case is disengaged from the cradle, that the second and third portions of the thread are properly entered and not cross threaded, also that the threads are clean and lubricated.

To replace the outer spring case:—

1. The converse of the above action takes place in re-assembling the spring case.
2. Before mounting the gun the "protector slide" on the front end of the cradle should be removed to prevent the leather portion of the protector forcing out the metal and breaking off the screws when sliding the gun home.
3. After the gun is mounted, replace the "protector slide."

Replacement Limits of Running out Springs.—The normal free length of each running out spring is as follows:—

Inner	..	..	..	18·58 inches.
Outer	..	..	..	19·65 inches.

Any one spring, inner or outer, found with a permanent set of 1¼-inches or more below the normal free length of the spring, will be replaced.

Alternative liquids which may be used in the hydraulic buffers in case of emergency:—

1. Pure glycerine, or a mixture of equal parts of glycerine and water.
2. Any heavy lubricating oil.
3. Soapy water, or water containing a proportion of soda.
4. Clear water may be used in a great emergency only, but it should on no account be allowed to remain in the cylinder for longer than is absolutely necessary, on account of its rusting action.

Kerosine, paraffin, or similar burning oils, must on no account be used for this purpose.

Limber and Wagon.

Lids.—Before closing the ammunition box lids of vehicles fitted with brass tubes, it should be carefully noted that the cartridge clips are properly turned to prevent the cartridges sliding out.

Lids, wagon limber.—In opening and closing the lids of this limber the centre lid must be opened first and closed last.

Tubes.—Care should be taken in filling ammunition boxes that the nose of the shell does not injure the first projection on the tubes.

Fuze indicator on wagon.—When not in use, the indicator should be properly laid back on top of the limber or wagon, and covered with the leather cover provided for the purpose.

AMMUNITION.

General Instructions for Care and Preservation of Ammunition.

The following points should receive special attention :—

(*a*) Care must be taken not to injure the cartridge cases or fuze covers when withdrawing the rounds from the four round boxes or the vehicles.

(*b*) The rounds should not be carried by the clip tapes nor rested on the fuze covers.

(*c*) The rounds should on no account be stacked on their ends, but on their sides, and then not more than two tiers high.

(*d*) In cases where fuze covers have become detached immediate steps should be taken to have them replaced, care being taken that the fuzes are at "safety"; and that the time ring is not loose, before the covers are replaced.

(*e*) When necessary the shell should be wiped over with boiled linseed oil, care being taken to avoid the fuze.

(*f*) Primers, if found to be unscrewed, should be tightened up.

Cartridge, Q.F., 18-pr., Shrapnel, Mark I,

(*Plate XXI.*)

Fixed ammunition is used. The complete round consists of a cartridge case with percussion primer, charge, shrapnel shell, and fuze.

The case is of solid drawn brass, slightly tapered towards the mouth, and has a hole in the base screwed and recessed to take a percussion primer. The cases are black lacquered (formerly "dulled") so as to render them as inconspicuous as possible.

The Mark I percussion primer consists of a metal body, screwed externally for a portion of its length to fit the hole in the cartridge case. The body is filled with †S.F.G.^{2} powder, the mouth being closed with a fine white paper disc beneath a cordite disc. The latter is finally coated with shellac after the lip of the body is spun over, to retain it in position. The head is recessed to receive a copper cap (containing 1·2 grains of composition) fitted in a brass chamber. The cap chamber forms the anvil, and has three fire holes. The cap is connected with the gunpowder charge in the body by a channel which contains a soft copper ball in a coned seating to seal the escape of gas after firing, and relieve the pressure on the cap. Two small recesses are formed in the flange of the head for the primer key.

The Mark I primer* (Plate XXIII) differs principally from the Mark I in having a metal closing disc with six radial slits and in the internal cupped recess being reduced in height.

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† Previous supplies are filled with R.F.G.^{2} powder.

The Mark II Primer (Plate XXIII) differs from Mark I* in not having a cap chamber, the cap being placed in a recess in the body and secured by a screwed plug; this plug forms the anvil at one end, the other end being bored out to form the sealing chamber which is closed by a perforated screwed plug.

The charge consists of 1 lb. $6\frac{1}{16}$ oz. of cordite M.D. size 8, in a circular bundle; the outer sticks are cut about 10·375 inches, and the inner sticks about 9·75 inches long, a recess being thus formed in one end to fit over the primer and the boss of the case; the other end of the charge is in contact with the base of the shell.

The Mark I shrapnel shell has a steel body with a recess in the base for a bursting charge of $1\frac{3}{4}$ oz. of R.F.G.² or new blank F.G. powder, contained in a tin cup. The flash from the fuze is conveyed to the charge by means of a brass tube, containing eight powder pellets weighing $\frac{3}{4}$ oz. The tube is fitted into the fuze socket and screwed into a steel disc which fits over the powder chamber and supports the bullets. The fuze socket is screwed into the head of the shell, is threaded to take the "Fuze, T. and P., No. 80," and fitted with a fixing screw to secure the fuze, and prevent it being turned when in position. The shell contains 364 mixed metal bullets (41 per lb.), and is fitted with a narrow copper driving band in a groove having two waved ribs.

The shell is secured in the case by the latter being indented into the cannelure of the shell in four places, each $1\frac{1}{4}$ inches long, the cannelure being filled with Pettman cement.

Shells of early manufacture will take Mark I fuze covers, but in later manufacture the fuze socket has been slightly modified, and such shells will take Mark II covers.

Mark II shrapnel shell differs from Mark I in the following principal particulars:—

The radius of head is struck with 2 diameters instead of $1\frac{1}{2}$ diameters.

The walls are strengthened at the lower part.

The lid of the tin cup for bursting charge is stronger and differs slightly in shape, the steel disc and bottom of central tube being altered to suit.

The shell contains about 375 bullets instead of 364.

The shells are painted lead colour to make them easily distinguishable from Mark I, which are painted black.

Dimensions, &c. (maximum).

			Inches.
Length of	complete cartridge	plugged	20·76
		fuzed	22·445
		over fuzed cover	22·538
	case		11·6
	shrapnel shell		9·868
Diameter of	case	at base	4·08
		at mouth	3·345
	shell	over body	3·29
		over driving band	3·39
			lb. oz.
Weight of	cartridge case with primer		2 15†
	charge		1 $6\frac{1}{16}$
	shrapnel shell filled and fuzed		18 8
Total weight of complete cartridge			22 $13\frac{1}{8}$

† A certain number of "light" cartridges have been issued, the cases of which weigh 2 lb. 5 oz. each.

Cartridge, Q.F. 18-pr., Star Shell, Mark I.

(Supplied when specially ordered only.)

The complete round consists of a cartridge case with percussion primer, charge, paper cylinder, star shell, and fuze.

The Mark I or II percussion primer* described on page 30 will be used with this ammunition.

The charge consists of 8 oz. of cordite M.D. size 4¼ in a circular bundle recessed at one end to fit over the boss inside the case and to permit of the insertion on the percussion primer. It is held in position in the case by the perforated paper cylinder with two perforated discs at each end, an unperforated disc being also secured to the end that comes in contact with the cordite charge.

The star shell has a steel body recessed in the base to receive a bursting charge of 3¼ drams R.F.G.[2] powder contained in a shalloon bag and threaded with quick match.

The head of the shell which is fitted with a metal G.S. fuzehole socket, and a wood block, is attached to the body with 6 brass screws and 6 steel twisting pins.

A metal central tube perforated with 12 fireholes is screwed into a wrought iron diaphragm over the bursting charge and is fitted at the top into the fuze socket.

The interior of the shell, which is "velvrilled" and lined with brown paper, contains 10 stars in tiers of 5. A perforated iron disc separates the tiers, and is supported by wood supports which are placed between the stars in each tier.

The faces of the disc are covered with felt washers, and a felt washer is placed between the top of the stars and the wood block in the head.

The ribs of the groove for driving band are waved.

The fuze, time, 15 seconds, No. 25, will be used with this shell.

Dimensions, &c. (maximum).

		inches.	
Length of	complete cartridge (with plug)	21·2	
	case	11·6	
	star shell	10·32	
Diameter of	case at base	4·08	
	case at mouth	3·345	
	shell over body	3·29	
	shell over driving band	3·39	
		lb.	oz.
Weight of	cartridge case with primer	2	15†
	charge	0	8
	star shell filled and fuzed	10	11¼
	Total weight of complete cartridge	14	2¼

Cartridge, Q.F., Blank, 18-pr., Mark I.

Tools, Cartridge, Q.F., Blank—

Drift, 18-pr., Mark I.

Ring, Inserting Cup, 18-pr., Mark I.

The blank cartridge consists of a service case and percussion primer with a charge of 1 lb. blank L.G. powder contained in a

† A certain number of "light" cartridges have been issued, the cases of which weigh 2 lbs. 5 ozs. each.

No. 1 class silk cloth bag, which is enclosed in a felt jacket. The mouth of the cartridge is closed by means of a split paper ring and leather-board cup.

The cup and split ring are inserted in the cartridge by means of the wood drift, and gunmetal ring.

The empty cases for making blank up locally are issued 20 in a "Box, cartridge case, Q.F. 18-pr."

Fuze, Time and Percussion, No. 80, Marks I, II and III.

(*Plate XXII.*)

The Mark I fuze is made of aluminium, and consists of the following principal parts, viz.:—body, top and bottom composition rings, two waterproof cloth washers, cap with set screw, base plug, and time and percussion arrangements.

The lower portion of the body is screwed to receive the holder for percussion arrangement, and the upper portion forms a short stem containing the time detonator pellet and its stirrup spring. The shoulder or flange of the body is graduated from 0 to 22, a square notch is cut for the "key, fixing," and a small cross to denote the safety point.

A pin is screwed into the lower time ring to form a projection by means of which the ring is set when the "key, setting" is required. A setting mark is cut on the ring.

The upper time ring is prevented from turning by two pins.

The cap is screwed on to the body over the upper time ring and closes the fuze. It is secured in position by a set screw.

The base plug is screwed externally to fit the bottom of the body.

The holder for percussion arrangement carries the needles for both the time and percussion detonator. It is bored to receive the percussion detonator, pellet, ferrule, stirrup spring, and spiral spring.

The fuze when set full should burn, at rest, for about 22 seconds.

To set the fuze, turn the setting mark on the lower ring, by the "key, setting" opposite the graduation required.

The Mark II fuze differs from the Mark I in the following principal particulars:—

The top of stem of body is bevelled all round at the top, instead of two slots being cut for the toes of the stirrup spring.

Later issues will have the numeral, lot number, and initials of maker of the fuze stamped on the tin band of the fuze cover. They will also have the time ring between 0 and 1 graduated in a similar manner to the other divisions of the ring, and the dagger denoting the safety point coloured red.

The Mark III fuze differs from the Mark II in having all external joints waterproofed.

Action.

Time Arrangement.—On shock of discharge, the detonator pellet sets back on to the needle, straightening the clips of the time stirrup spring, firing the detonating composition, and so igniting the composition of the top ring, which in succession lights that in the lower ring, and so fires the fuze.

Percussion Arrangement.—On shock of discharge, the ferrule sets back over the detonator pellet, straightening the clips of the per-

cussion stirrup spring; the whole is then free to move forward on impact or graze, and after compressing the spiral spring, the detonator upon striking the needle ignites the composition, and so fires the magazine.

Weight of fuze .. .. $10\frac{1}{4}$ oz.

The tin cylinder (if required) for this fuze (to hold one) will be known as "Cylinder No. 80 F," and will be painted green, with yellow labels.

Fuze, Time, 15 Seconds, No. 25, Mark II.

(*For Star Shell.*)

This fuze is made of aluminium, and consists of the following principal parts, viz.:—Body, time ring, top cap, safety pin, detonator pellet with detonator, stirrup spring, needle plug, magazine, bottom plug, and leather washer.

The lower portion of the body contains the magazine channel and magazine, and the upper portion forms a stem and contains the detonator pellet with detonator, and the needle plug. The shoulder of the body has a black mark to coincide with an arrow on the time ring, when set at safety.

The time ring, which is graduated from 0 to 44, is fitted round the exterior of the stem.

The top cap fits over the time ring, on top of a steel washer, and closes the head of the fuze. It is secured by a steel keep screw.

A copper safety pin provided with a loop of red cord, passes through the top cap and the detonator pellet.

The detonator pellet is suspended by the safety pin, and a stirrup spring, which is kept in position by its two clips.

The magazine contains about 45 grains of R.F.G.^{2} powder, and is closed by means of the bottom plug.

Action.

On shock of discharge the detonator pellet sets back, thereby straightening the clips of the stirrup spring and, being driven on to the needle of the needle plug, ignites the detonator, which fires the composition of the time ring, this burning till it reaches the magazine channel, thereby igniting the powder in the magazine.

Weight .. .. .. $5\frac{3}{4}$ ozs.

Covers, Fuze, Time and Percussion, No. 80, Marks I and II.

The Mark I cover, which is of brass, is to protect the fuze in the shell until required for firing. It consists of a cap, a screwed ring with base ring and tin band, and a dermatine washer.

The cap is shaped to fit over the fuze, and has a screw thread to engage with the thread on the screwed ring.

The base ring is shaped to fit the nose of the shell, and is attached to the screwed ring by means of the tin band.

The Mark II cover differs from Mark I in the base ring being of slightly different form to suit shells having the modified fuze socket, for which the Mark I cover is not suitable.

Weight .. .. 2½ oz.

Instructions for Removing Cover.

To prepare for firing:—

Tear off the tin band, when the cap, together with the screwed ring, will fall off, leaving the fuze exposed.

CLIP, CARTRIDGE, Q.F. 18-PR., MARK I.

The clip is made of brass, cross-shaped so as to form four arms, the ends of which are turned in to form clips to engage with the rim of the cartridge case. One arm is painted red, and is slightly longer than the others, the clip portion being differently shaped so as to spring over the rim of the cartridge.

It has a canvas loop for withdrawing the cartridges from the baskets or tubes in the ammunition boxes of the limbers and wagons.

The clip protects the cap of the percussion primer, and in the case of vehicles fitted with the brass tubes also serves to hold the cartridge in the tube as follows:—

The cartridge (with its clip fixed) is inserted so that the red arm engages with the extended portion of the rim of the tube. When fully inserted, the clip is given part of a turn, thus bringing the end of the red arm inside the rim of the tube, and locking the cartridge in position.

KEY, FIXING FUZE, T. AND P., NO. 80.

(*Plate XXIV.*)

The key is of steel, one end being shaped to fit over the fuze; the lower edge of the ring portion is bevelled to suit the fuze, and is provided with a projection to fit the square notch in the flange of the fuze body.

Total length of key .. .. .. 6·875 inches.

KEY, SETTING FUZE, T. AND P., NO. 80, MARKS I AND II.

(*Plate XXIV.*)

The Mark I key is for use when the lower time ring is too stiff to set by hand. It is made of steel, and formed to engage with the pin projection of the lower time ring. It is provided with a loop of white line, 30 inches in length.

The Mark II key differs from the Mark I in the ring portion being of greater depth, thereby taking a better seating on the fuze.

Total length of key .. .. .. 6·17 inches.

KEY, PRIMER.

(*Plate XXIV.*)

This key is for use in inserting or removing the percussion primer in the cartridge. It is made of steel, and formed to engage with the two recesses in the head of the primer. It is also fitted with a white line lanyard.

Total length of key .. .. .. 13·1 inches.
" " lanyard .. .. 43 "

SECTION GUN DRILL.

(18-PR. Q.F. GUN.)

ARRANGEMENT.

THE DETACHMENT—
- To tell off.
- Detachment rear.
- To form detachment rear in action.
- To take post from detachment rear in action.

MOUNTED—
- To mount.
- To dismount.

To move the gun with drag ropes, when limbered up.
To move the gun without drag ropes, when limbered up.
To move the gun with drag ropes, when unlimbered.

PREPARE FOR ACTION.
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TO REPLACE A DAMAGED WHEEL.
MOUNTING AND DISMOUNTING ORDNANCE.
METHOD OF DRILLING RECRUITS.

SECTION GUN DRILL.

Fire discipline, which does not vary with the equipment, is given in "Field Artillery Training."

The following paragraphs give the duties of the detachments at the section commander's orders.

Single detachments should be accustomed to drill as if forming part of a section, and the instructor should therefore always use the orders given for the section commander.

On dismounted parades the detachment will form "*Detachment Rear*," and **6**, **7**, **8** and **9** will attend to the limber, **6** and **7** pushing in rear, **8** and **9** at the pole.

THE DETACHMENT.

The detachment consists of **10** men. The senior non-commissioned officer is **1**, and is in charge of the sub-section; the next senior is **10**, and is the coverer, as laid down in "Field Artillery Training."

The detachment fall in two deep, one pace between ranks, **1** on the right of the front rank.

To Tell Off.

Section Commander.	No. **1**.
....Section—Tell Off.	

At the order from the section commander—**1** numbers himself **1**; the right hand man of the rear rank **2**; the right hand man of the front rank **3**; the second man from the right of the rear rank **4**; his front rank man **5**; and so on.

The second senior will number himself **10**.

2, **3**, **4**, **5** and **6** are named:—

2. "Range setter."
3. "Layer."
4. "Loader."
5 and **6.** "Fuze setters."

Detachment Rear.

Formed as above, three yards in rear of the gun wheels, **1** covering the off wheel.

To Form Detachment Rear in Action.

Section Commander.	No. **1**.
....Section—Detachment Rear.	No..... Double March.

At the order from the section commander—**1** doubles to his place (three yards in rear of and covering the right wheel), and gives the order "*Double March.*"

At the order from **1**—the remainder double to their places by the shortest way and halt.

To take Post from Detachment Rear in Action.

Section Commander.	No. **1**.
....Section—Take Post.	No..... Double March.

At the order from **1**—The detachment double to their places by the shortest way and halt.

MOUNTED.

1 and **10** on their horses, when limbered up, usually on the left of the gun and wagon leaders respectively; **2** and **3** on the gun limber; **4** and **5** on the limber, **6** on the wagon of the firing battery wagon; **7** and **8** on the limber, **9** on the wagon of the first line wagon; **2, 4, 6** and **8** on the near side; **3, 5, 7** and **9** on the off side.

TO MOUNT.

Section Commander.	No. 1.
......Section—Detachments Prepare to Mount—Mount.	

At the order from the section commander "Detachments—Prepare to Mount"—The men double to their places at the carriages; **2, 4** and **8** lay hold of the guard irons with their left, **3, 5** and **7** with the right hand, placing the inner foot on the trail or perch; **6** with his right hand, **9** with his left hand, lays hold of the guard iron, placing their inner foot on a spoke.

At the order "Mount"—The whole spring into their places, the men on the limbers turn round to the front, lifting their feet close together and throwing them over the guard irons.

At the order "Attention"—The men on the carriages sit upright, holding the handstraps with their inward and the guard irons with their outward hands. When going over rough ground they should slightly raise themselves to avoid being jolted.

At the order "Sit at Ease"—They place the outward upon the inward hand and sit well back.

TO DISMOUNT.

Section Commander.	No. 1.
....Section—Detachments Prepare to Dismount—Dismount.	

At the order from the section commander "Detachments Prepare to Dismount"—All the men except **6** and **9** turn to the rear, throwing their legs over the guard irons; **6** and **9** stand up.

At the order "Dismount"—The whole jump off and form detachment rear.

TO MOVE THE GUN WITH DRAG ROPES, WHEN LIMBERED UP.

Section Commander.	No. 1.
....Section—With drag ropes, Prepare to Advance.	

At the order from the section commander—**2** and **3** hook the drag ropes to the gun wheel washers; the two highest numbers go to the pole, and the remainder man the ropes. Even numbers on the near side, odd on the off.

TO MOVE THE GUN WITHOUT DRAG ROPES, WHEN LIMBERED UP.

Section Commander.	No. 1.
.. Section—Without drag ropes, Prepare to Advance.	

At the order from the section commander—**2** and **3** push in rear of the shield; **4** and **5** man the gun wheels; the two highest numbers go to the pole, and the remainder assist.

TO MOVE THE GUN WITH DRAG ROPES, WHEN UNLIMBERED.

Section Commander.	No. 1.
.. Section—With drag ropes, Run up.	

At the order from the section commander—**2** and **3** hook the drag ropes to the gun wheel washers, or loop in front of the shield; **1** mans the traversing lever, and the remainder the drag ropes.

PREPARATION FOR ACTION.

As the fuzes are liable to deteriorate rapidly when unprotected from damp, it is important that a battery commander should order that only such as are required for immediate use should be uncovered.

Section Commander.	No. 1.
.... Section—Prepare for Action.	

At the order from the section commander—**1** and the detachment, if mounted, dismount, and—

1 sees that the bore is clear, superintends the other men, and satisfies himself that the gun and carriage are in all respects ready for action.

2 removes muzzle and breech covers, and straps them on the front of the shield, examines the breech, safety catch, firing mechanism, extractor, ranging gear, clamping gear, shield and brake.

3 examines sights, brake, elevating, traversing and firing gear, and sets traversing gear at zero.

4 examines the gun limber box.

The men on the wagons examine the wagon boxes.

The men detailed to examine the various ammunition boxes will see that they are properly filled, that the lids open and close easily, and that the fuze indicator and locks are in good order, uncover fuzes, if ordered, and see that they are set at safety.

Any deficiencies in the firing battery will be made up from the first line wagons under the direction of **1**.

When the gun has only a short distance to travel to the position, if the ground admits, it may be depressed before going into action.

Each man resumes his place as soon as he has completed his duties.

DUTIES.

1, before leaving the gun park, will ascertain that the buffer is properly filled.

Commands, attends to traversing lever. He will occasionally examine the settings on the range and fuze indicators.

He is responsible for the entire service of the gun.

He lays for direction by looking along the gun before the spade is engaged in the ground.

He only gives the words of command shown for him; he does not repeat the section commander's orders; his executive orders should be no louder than is necessary for his sub-section to hear.

2 attends to the breech and safety mechanism, puts elevation on range indicator and fuze indicator when necessary, reporting "*Set*" when this is completed; and attends to the clamping gear.

He lowers and raises the shield, and puts on the brake.

He opens and closes the breech as follows:—

To open the breech—He takes hold of the lever with the left hand (pressing the spring with his fingers) and draws it smartly towards him.

To close the breech—He takes hold of the lever with his left hand and swings the breech screw smartly round into its position in the gun.

He must be careful that he is clear of the recoil of the gun before he reports "*Set.*"

He should always follow up the range and corrector settings ordered on his fuze indicator.

3 lays and fires, attends to releasing lever of brake in action, and assists **2** to raise the shield.

He attends to the telescope, and dial sight when in use.

He sees that the traversing gear and quick release lever are secured by their straps before limbering up.

4 loads.

He plants aiming posts, shifts them if required, and brings them in on the order "*In Aiming Posts.*"

5 issues ammunition, sets fuzes and corrector settings on indicator on wagon.

6 assists **5** in his duties.

5 and **6** should always follow up the range and corrector settings ordered on the fuze indicator.

N.B.—The brake is always to be put on when in action.

When putting on the brake, either for travelling or firing, great care should be taken that the brake be not put on too hard.

When in action, the brake should be put on with the quick release lever housed. If for any reason a change of position of the carriage is required without limbering up, the brake should be taken off and put on again by the quick release lever only.

SIGNALS.

Nature.	By whom given.	Meaning.
Either hand raised above his head.*	1 During ranging for elevation.	My gun is loaded and layed.

ACTION.

Section Commander.	No. 1.
....Section—Action Front.	No.....Action Front.

* Should he see that the section commander does not observe his signal, he will call his attention by repeating "*No. .... Ready.*"

At the order from **1**—

The detachment dismount, **3** unkeys and with **2** lifts the trail; when the trail is clear of the hook, **3** orders "*Limber drive on.*"

2 and **3** carry the trail round half a circle to the left (**2** shifting round the trail eye to avoid walking backwards), and lower it to the ground.

4 and **5** man the wheels.

As soon as the trail has been lowered to the ground—

1 throws back the traversing lever, lays approximately for direction, and points out the target to **3**. After the first round, full use should be made of the traversing gear to lay for direction.

In order to check the lateral movement of the carriage, when the gun is in action on a slope, he will direct the layer to adjust the traversing gear to one or two degrees on the side of the higher wheel.*

2 lowers the shield, unclamps clamping gear, puts on brake, fixes fuze indicator, adjusts the range indicator as ordered and opens the breech.

3 fixes sight clinometer and dial sight and lays. As soon as the gun is layed, and the breech closed, he places his hand on the firing lever, and reports "*Ready.*"

If telescope sight is ordered, he fixes and uses it.

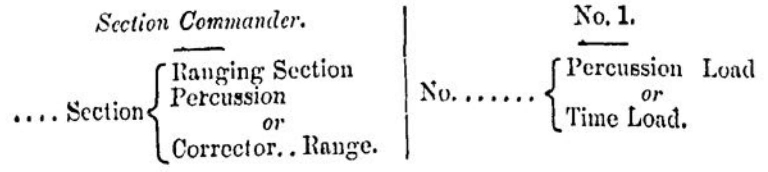
5 and **6** open the lid of ammunition wagon, partly withdraw about six rounds, remove the cartridge clips, and adjust the indicator as ordered. They examine all primers to see that they are screwed tight home, and screw up any which require it.

The position of the detachment is as follows:—

1 kneels on the left side of the trail.
2 sits on seat on right side.
3 sits on seat on left side.
4 kneels behind **3**, or behind **2** if the wagon is on the right of the gun or at limber supply.
5 kneels in rear of wagon on right side.
6 kneels in rear of wagon on left side.
7, **8** and **9** remain with the first line wagons, they assist in the supply of the ammunition and replace casualties in the firing battery as ordered.

TO LOAD.

At drill, only drill cartridges without shell will be placed in the bore.



Section Commander.	No. 1.
.... Section { Ranging Section / Percussion / *or* / Corrector.. Range.	No....... { Percussion Load / *or* / Time Load.

At the order from **1** "*Percussion Load*"—

5 or **6** sees that the fuzes are set at safety and supplies the round to **4**.

4 places the round in the bore.

* He must always hold the traversing lever while the gun is being fired to assist in keeping the carriage steady.

2 closes the breech, adjusts the range indicator to the elevation ordered, and reports "*Set*," when ready.

If the order "*Corrector...... Range*" is given, **5** or **6** will set the fuze indicator as ordered, and by hand or with the "*Key, fuze setting*," set the fuze to the graduation shown opposite the range on the indicator.

TO FIRE.

A gun is not to be fired without the *order* from **1**, and **1** must never give this order until he sees that the gun is in all respects ready, and, during ranging for elevation, until he has received the order from the section commander.

Section Commander.	No. **1**.
	No......... Fire.

At the order from **1** "*No......... Fire.*"
3 fires the gun by pulling the lever.*
As soon as the gun is fired—
2 opens the breech.
3 relays.

MISS-FIRE.

If there is a miss-fire, the firing lever is pulled again at once. If it again fails to fire, after an interval of one minute the gun is unloaded, a fresh round placed in the bore, and the gun is fired when ordered.

The round, when removed from the gun, should be examined to see if the cap has been struck, and if so, taken to the rear, the primer removed from it, and a spare one substituted by means of the key provided for the purpose.

If not struck, the striker should be examined, and, if necessary, changed.

GUN FIRE.

Section Commander.	No. **1**.
...... Section.	No.... Time Load.
...... Rounds Gun Fire.	

1 gives the order to fire as soon as the gun is reported "*Ready*" and "*Set*," and continues to reload and fire until the specified number of rounds has been fired.

MAGAZINE FIRE.

Section Commander.	No. **1**.
...... Section—Magazine Fire.	No...... Time Load.

* **2** and **3** should not remain on the seats for the first round, if the trail is resting on very hard ground.

2 sets the range indicator to 1,000 yards.
3 lays over the sights.
4 loads.
5 and **6** supply **4** with ammunition, fuzes set at 2.
1 gives the order to fire as soon as the gun is reported "*Ready*" and "*Set*," and continues to reload and fire until further order.

TARGETS UNDER 500 YARDS.

Section Commander.	No. **1**.
....Section—Fuze "0" Rapid Fire.	No.....Time Load.

2 sets the range indicator to 500 yards.
3 lays over the sights.
4 loads.
5 and **6** supply **4** with ammunition, fuzes set at "0."
1 gives the order to fire as soon as the gun is reported "*Ready*" and "*Set*," and continues to reload and fire until further order.

CHANGE OF TARGET.

At a change of target, the gun should be run forward or back, to clear the spade from the old hole.

TO STAND FAST.

Section Commander.	No. **1**.
......Section—Stand Fast.	

At the order from the section commander—
All stand fast, whatever they are doing. At the order "*Go on*," the work is continued.

CASUALTIES.

The replacement of casualties will be carried out as laid down in "Field Artillery Training."
Section commanders order such changes of duties in their sections and detachments as they consider necessary.
If the full detachments cannot be maintained, the duties are divided as follows:—
With 5 men—**5** performs the duties of **5** and **6**.
With 4 men—**4** performs the duties of **5** and **6**; **1** the duties of **1** and **4**.
With 3 men—**1** performs the duties of **2** as well as his own; **2** performs the duties of **4, 5** and **6**.
3 no change.

TO UNLOAD.

Section Commander.	No. **1**.
....Section *or* No.....Unload.	No.....Unload.

At the order from **1**—
2 opens the breech slowly, and **4** withdraws the round.

TO CEASE FIRING.

Before giving the order to cease firing, guns must be unloaded.

Section Commander.	No. 1.
.... Section—Cease firing.	

At the order from the section commander—

1 folds the traversing lever on the trail.

2 closes the breech, takes off the brake, depresses the gun to its full extent, raises the shield, and secures the clamping gear.

3 sets traversing gear at zero, runs down the elevating gear to the travelling position, assists **2** to raise the shield, replaces sight-clinometer, telescope, and dial sight, if in use.

5 and **6** reset fuzes at safety, replace ammunition, close the lid, lower the fuze indicator and replace cover. If the lids of the wagon limber are open, they should be closed before attempting to move the wagon.

TO LIMBER UP.

Section Commander.	No. 1.
.... Section—Front Limber up.	

At the order from the section commander—

2 and **3** carry the trail round half a circle to the right (**2** shifting round the trail eye to avoid walking backwards), and lower it to the ground.

4 and **5** man the wheels.

As soon as the trail is lowered the detachment gets under cover—

1 in front of **2**.

2 and **3** between breech and wheels.

4 and **5** between muzzle and wheels.

The whole with their backs to the axletree.

The limber comes up as detailed in "Field Artillery Training," and **1** orders "*Halt—Limber up.*"

At the order from **1**—

2 and **3** lift the trail and place it on the hook.

3 keys up.

4 and **5** man the wheels.

On completion of the above, the detachment mounts without further order.

Right, Left and Rear Limber Up are the same, except that at—

Right Limber Up—The trail is carried round a quarter of a circle only.

Left Limber Up—The trail is carried round a quarter of a circle to the left, **3** in this case shifting round the trail eye.

Rear Limber Up—The trail is not carried round.

The limber in all cases moves as detailed in "Field Artillery Training."

AIMING POSTS.

Laying by means of Aiming Posts.

The procedure is as laid down in "Field Artillery Training."

As soon as the guns are in action, **4** doubles out about 50 yards in front of the gun with his two aiming posts, kneels down, and, as soon

as the angle has been ordered for his gun, stands up, repeats the order (if necessary), and plants his aiming posts as directed by **3**. In planting the aiming posts, the one nearer the gun will be planted first.

If a new line of fire is ordered, **4** will go to the far aiming post, and, on a signal from **3**, pick it up; he then picks up the near one and proceeds to replant them as above.

Change of Target.

The deflection on the rocking bar sight is added to, or deducted from, the angle ordered.

The dial sight is set to the angle thus obtained, the rocking bar sight and traversing gear are then set at zero.

The dial sight is then laid on the aiming posts by moving the trail.

If necessary the aiming posts are taken up and replanted in line with the rocking bar sight or dial sight set at zero.

TO CHANGE A DAMAGED WHEEL.

Should a gun wheel be disabled in action, it should be immediately turned so as to bring the sound portion on to the ground, and notice sent to the Captain.

The latter will immediately send up another wheel, which will be brought alongside the damaged one, and the wheels changed as follows:—

Section Commander.	No. **1**.
No...., Change wheels.	No.... Change wheels. Lift. Lower.

At the order from **1** "*No.... Change Wheels*"—

2 and **3** apply the lifting jack on the side of the damaged wheel and lift the carriage, **3** takes off the brake.

1 and **6** go to the damaged wheel, **1** in rear; **6** removes the dust cap, linch pin, drag washer, and adjusting collar.

At the order "*Lift*"—

The damaged wheel is taken off, **6** rolls it out of the way, and the new wheel is put on by the men who brought it up; the adjusting collar, linch pin, drag washer and dust cap are put on by **6**.

At the order "*Lower*"—

2 and **3** remove the lifting jack, **3** puts on the brake, and all resume their duties in action.

The damaged wheel is either left on the ground, or removed by the men who brought up the new one, as the Captain may have directed.

If the lifting jack is not available, the following procedure may be employed for lifting the carriage:—

At the order from **1** "*No.... Change Wheels.*"

4 and **5** remove the pole from the wagon limber, and hand it to **2** or **3** (according to the side).

2 raises the shield and **3** takes off the brake.

2, **3**, **4** and **5** man the pole, which is placed under the shield by **2** or **3** (according to the side).

About four extra men from the other detachments should assist to lift the carriage.

When the new wheel is put on, **4** and **5** replace the pole, **2** lowers the shield and puts on the brake, and **6** replaces the collar, linch pin, drag washer and dust cap.

MOUNTING AND DISMOUNTING ORDNANCE.

This should only be practised at the annual courses of military training, and then only sufficiently for instruction; every care must be taken that the equipment is not injured.

To Dismount the Gun, Cradle and Carriage.

Section Commander.	No. **1**.
Dismount No...... Gun, cradle and carriage.	No..... Prepare to dismount the gun. Dismount the gun. Prepare to dismount the cradle. Lift. Lower. Dismount the carriage. Lift. Lower.

At the Order from **1** "*Prepare to dismount the gun*"—**1** removes the traversing lever, **2** and **3** depress the gun, remove the breech fittings, and the nut connecting the breech ring of the gun to the buffer. **2** places a handspike in the breech, and **2**, **3**, **4**, and **5** man it. **6** brings up two handspikes, hands one to **2**, and passes the other one in rear of the cradle guard to **7**, to receive the gun when the muzzle is clear of the cradle.

8 and **9** place themselves at the muzzle.

As soon as **1** sees that all is ready, he gives "*Dismount the gun.*"

At the order from **1**—

6 elevates the gun to allow it to slide through the cradle, **2**, **3**, **4** and **5** lifting at the handspike in the breech, **8** and **9** pushing at the muzzle until it is clear of the front of the cradle, **8** and **9** then assist **6** and **7** to support the gun when the muzzle is clear of the cradle. As soon as the gun is clear of the cradle it is lowered gently to the ground.

At the order from **1**, "*Prepare to dismount the cradle*"—

2 and **3** remove the capsquares, sight bars, firing lever and elevating screw. **2** places a handspike in the rear opening of the cradle.

6, **7**, **8** and **9** place themselves at the front of the cradle.

At the order from **1**, "*Lift*"—**2**, **3**, **4** and **5** lift at the handspike; **6**, **7**, **8** and **9** lift at the front of the cradle; when the trunnions are clear the cradle must be slewed to the right or left, to enable it to clear the opening in the shield. The cradle is carried to the rear until the front cap of the spring rests on the axletree; **6**, **7**, **8** and **9** move round and assist in carrying the cradle clear; **1** gives "*Lower,*" and the cradle is lowered gently to the ground.

At the order from **1**, "*Dismount the carriage*"—

2, **3**, **4** and **5** go to the carriage; **2** and **3** in rear, **4** and **5** in front.

6, 7, 8 and **9** go to the wheels; **6** and **7** in front, **8** and **9** in rear. **8** and **9** remove the dust caps, linch pins and adjusting collars.

At the order from **1**, "*Lift*"—

The carriage is lifted and the wheels are taken off.

At the order from **1** "*Lower*"—

The wheels are placed on the ground, dish down, and the carriage is lowered to the ground.

To Mount the Gun, Cradle and Carriage.

Section Commander.	No. 1.
Mount No.... Gun, cradle and carriage.	No.... Mount the carriage. Lift. Mount the cradle. Lift. Prepare to mount the gun. Lift.

This is exactly the opposite to the dismounting just described.

As soon as the gun is pushed home in the cradle it should be depressed until the breech ring is secured to the buffer.

METHOD OF DRILLING RECRUITS.

Many good recruits are acquainted only with the commonest English words, and, as their duties and the material they have to use are altogether new and strange, the instructor should be careful—

To use the simplest language possible.

To explain, as they occur, all technical terms.

To illustrate descriptions by means of a piece of chalk, or otherwise, and in all cases to render clear the object of the various duties.

Not to attempt to teach recruits elaborate descriptions, exact measurements, etc., which they do not understand.

To avoid needless repetitions or wearying the men by keeping them for a long time at one thing, the drill should be varied by short descriptions (avoiding manufacturing details), setting fuzes, etc.

To bring men forward by successive steps, by explaining a position and then doing it; for instance, when commencing recruits' gun drill, the instructor should himself show how a duty should be performed, and then cause every man in turn to do that duty (make every man do **1**'s duty, then every man **2**'s, then **3**'s, and so on). When each man knows the duties of each post separately, the men who work and move together should be instructed after the manner described below, before commencing gun drill in quick time.

Great patience is necessary on the part of the instructor.

He must make allowance for the different capacities of the recruits, and squads should periodically be arranged so that the intelligent soldier may reap the advantage of his work, and not be kept back by those of inferior ability. Recruits as they progress should be called out in turn to drill, for this gives a man confidence, helps him to learn, and causes him to take an additional interest in his work.

The instructor should place himself where he can be seen and heard by all in the squad, should stand in a smart, soldierlike attitude, and should avoid pacing up and down, looking down on the ground, turning his back to the squad, and similar habits, which have the effect of fidgetting the men and distracting their attention.

His explanations should be given in a distinct voice; his word of command should be sharp and decisive.

Stress is laid on the above points, because men unconsciously imitate their instructors. A first-class instructor will make a good detachment; his manner and style are therefore of the first importance.

The utmost alertness of attitude and smartness of movement should be enforced throughout gun drill; but while the instructor is giving detail or explanations of equipment, etc., the detachment should be allowed to stand easy.

The instructor can at any time ascertain that each man is at his post, by proving. This he does by calling out "*prove*"—**1**, **2**, etc., when the men named prove in succession, as detailed in "Cavalry Training."

If at any time the instructor wishes to change the positions of the men, he gives the order "*Change rounds.*"

On this, **1** becomes **9**; **9**, **8**; **8**, **7**; etc.

The following is only an example of how drill should be taught.

The details of the other operations should be divided up in a similar manner.

TO LOAD.

At the order from the section commander—

"*. . . . Section—Percussion.*"

1 gives the number of his gun and "Percussion Load."

"*. . . . Section—Percussion.*"

Next explain that—

At the order from **1**—

4 places the round in the bore, and **2** closes the breech.

4 and **2** "*go on.*" Etc., etc.

LIST OF STORES.

CARRIAGE.

Articles.		No.	Where carried.
Brush, breech screw	..	1	In tool case, rear of shield.
Can, lubricating, No. 9	..	1	In wood block, rear of shield.
Case, Mark III field clinometer† ..	..	1	On shield.
Case, automatic fuze setter† ..	..	1	On shield.
Case, keys, setting fuze†	..	1	On shield.
Case, No. 1, dial sight†	..	1	On shield.
Case, sight clinometer†	..	1	On shield.
Case, telescope†	..	1	On axletree.
Case, tools†	..	1	On axletree.
Cleaner, piasaba, No. 7	..	1	In tubular trail.
Cleaner, wool, No. 1	..	1	In tubular trail.
Clinometer, field, Mark III.. ..	..	1*	On rear of shield.
Clinometer, sight, Q.F., 13 and 18-pr.†	..	1	In case, on shield.
Cover, breech..	..	1	On gun. When not in use strapped to front of shield.
Cover, muzzle, No. 1	..	1	On gun. When not in use strapped to front of shield.
Funnel, filling hydraulic buffer ..	..	1	In tool case, rear of shield.
Hammer, claw, 20-oz.	..	1	In tool case, rear of shield.
Implements, fuze, shell, and cartridge—			
Keys, setting fuze, T. and P., No. 80	..	2	In case on shield.
Lanyard, firing, Q.F., 13 and 18-pr.	..	1	In tool case, rear of shield.
Oil, Rangoon	pts.	½	In lubricating can.
Pliers, flat nose	pr.	1	In tool case, rear of shield.
Posts, aiming	..	2	On front of shield.
Setter, fuze, automatic, Q.F. 18-pr.	.	1	In case, rear of shield.
Sight, dial, No. 1	..	1	In case, on shield.
Spanner, McMahon, 15-in.	..	1*	In tool case, rear of shield.
Spanner, McMahon, 9-in.	..	1	In tool case, rear of shield.
Spanner, No. 244†	..	1	In tool case, rear of shield.
Spanner, hydraulic buffer, No. 122†	..	1	In tool case, rear of shield.
Spanner, hydraulic buffer, No. 123†	..	1	In tool case, rear of shield.
Spanner, hydraulic buffer, No. 129†	..	1	In tool case, rear of shield.
Telescope, sighting No. 4	..	1	In case on axletree, left side.
Tool, withdrawing split pins† ..	..	1	In tool case, rear of shield.

* Per section. † Components of carriage.

LIMBERS.

(Carriage and Ammunition Wagon.)

Article.	Carriage.	Wagon.	Where carried.
Apparatus, adjusting running out springs, Q.F., 18-pr.	—	1*	On platform board.
Axes, felling, curved helve	1	—	On platform board.
Axes, pick, heads, 4½-lb.	1	1	Under limber.
Axes, pick, helves, 36-in., ferruled	1	1	Under limber.
Bar, supporting draught pole, No. 3 (spare)	1	1†	On platform board.
Blankets, G.S.	4	2	On top of limber box.
Box, grease, 3-lb.‡	1	1	Under platform board, "near" side.
Breast pieces	2	2	On platform board.
Brushes, water, carriage	1	1	Under platform board, "near" side.
Buckets, water, G.S., canvas	12	6	In wire net receptacles.
Cans, lubricating, No. 3, for Rangoon oil‡	1	1	Under platform board, "off" side.
Cans, lubricating, No. 3, for mineral oil‡	1	1	Under platform board, "off" side.
Cartridges, Q.F., 18-pr., shrapnel	24	38	In ammunition box.
Cartridge, Q.F., 13 and 18-pr.— Primers, percussion (in tin box) (spare)	—	4	Tray, small stores.
Clips, cartridge, Q.F., 18-pr.	24	38	On cartridges.
Cloths, sponge	5	5	Under tray, small stores.
Collars, adjusting, 2nd class, "C," capped wheels (spare)	1§	1†	Tray, small stores.
Cover, apparatus adjusting running out springs, Q.F., 13 and 18-pr.	—	1*	On apparatus.
Drift, B.L. and Q.F., 4·3 in. × ·095 in.	1	—	Tray, small stores, upper.
Driver, screw, G.S., 4-in.	1‖	1	Tray, small stores.
Files, smooth, flat, 6-in.	1	—	Tray, small stores, lower.
Files, smooth, hand, safe edge, 6-in.	1	—	Tray, small stores, lower.
Files, second cut, half round, 6-in.	1	—	Tray, small stores, lower.
Gauge, striker, protrusion, No. 1	1	—	Tray, small stores, upper.
Grease, lubricating .. lbs.	3	3	In grease box.
Handle, file, small	1	—	Tray, small stores, lower.
Hooks, bill	1	1	Under platform board, "off" side.
Implements, fuze, shell and cartridge— Holder, cartridge	—	1¶	Under tray, small stores.
Keys, fixing, fuze, T. and P., No. 80	1§	1	Tray, small stores.
Keys, primer, Q.F., 13 and 18-pr.	—	1†	Tray, small stores.
Keys, setting fuze, T. and P., No. 80	2§	2	Tray, small stores.
Key, pole pin, Nos. 17 to 18 poles (spare)	1§	1†	Tray, small stores.
Oil, mineral (for buffers) .. pts.	2	2	In cans, lubricating.
Oil, Rangoon .. pts.	1	1	In cans, lubricating.
Ordnance, Q.F., 13 and 18-pr.— Catch, retaining breech screw (spare)	1	—	Tray, small stores, upper.
Springs, main (spare)	2	—	Tray, small stores, upper (in rectangular tin box).
Springs, safety catch (spare)	2	—	Tray, small stores, upper (in rectangular tin box).
Springs, trigger (spare)	4	—	Tray, small stores, upper (in rectangular tin box).
Springs, tripping piece (spare)	1	—	Tray, small stores, upper (in rectangular tin box).
Striker (spare)	1	—	Tray, small stores, upper.

* Per battery, carried in "A" sub-section. † Per sub-section. ‡ Components of limber
§ Lower tray. ‖ Upper tray. ¶ Per section

LIMBERS—*continued.*

(Carriage and Ammunition Wagon.)

Article.	Carriage.	Wagon.	Where carried.
Pins, capsquare .. .. (spare)	1	—	Tray, small stores, lower.
Pins, keep, split, 1/16 in. × 1¼ in.	2	—	Tray, small stores, upper (in rectangular tin box).
Pins, keep, split, 3/32 in. × 1½ in.	2	—	Tray, small stores, upper (in rectangular tin box).
Pins, keep, split, 5/32 in. × 1¾ in. .. (spare)	3	—	Tray, small stores, upper (in rectangular tin box).
Pins, keep, split, ⅛ in. × 1 in.	3	—	Tray, small stores, upper (in rectangular tin box).
Pins, keep, split, ⅛ in. × 2½ in.	1	—	Tray, small stores, upper (in rectangular tin box).
Pins, keep, split, ⅛ in. × 1¼ in. .. (spare)	9	—	Tray, small stores, upper (in rectangular tin box).
Pins, keep, split, 3/16 in. × 1 in.	2	—	Tray, small stores, upper (in rectangular tin box).
Pins, keep, split, ¼ in. × 5 in.	2	—	Tray, small stores, lower.
Pins, linch, 2nd class, "C," capped wheels (spare)	1†	1*	Tray, small stores.
Pins, locking, shield pawl .. (spare)	1	—	Tray, small stores, lower.
Pins, pole, Nos. 17 to 19 poles (spare)	1†	1*	Tray, small stores.
Plugs, filling hole, hydraulic buffer, No. 12 (spare)	2	—	Tray, small stores, lower.
Rings, packing, hydraulic buffer (spare)	2	—	Tray, small stores, upper, each in round tin box.
Ropes, drag, light, G.S. .. .. pairs	1	1	On platform board.
Screws, lubricating hole, boss-head, 3/16 in. × ¼ in. .. .. .. (spare)	6	—	Tray, small stores, upper (in rectangular box).
Shovels, G.S.	2	2	On platform board, for wagon limber, and 1 on each side of box for carriage limber.
Springs, disc, No. 62 .. (spare)	2	—	Tray, small stores, lower.
Springs, firing gear .. .. (spare)	2	—	Tray, small stores, lower.
Springs, shield pawl .. (spare)	1	—	Tray, small stores, lower.
Springs, sight clinometer (spiral) (spare)	1	—	Tray, small stores, upper (in rectangular box).
Springs, traversing lever .. (spare)	2	—	Tray, small stores, upper.
Straps, supporting, front .. (spare)	4	4	On platform board.
Straps, supporting, rear .. (spare)	2	2	On platform board.
Straps, trace.. .. .. (spare)	4	4	On platform board.
Stud, retaining stuffing box, hydraulic buffer .. .. .. (spare)	1	—	Tray, small stores, upper (in rectangular tin box).
Swingletree, Nos. 10A or 11 (spare)	1	1	On platform board.
Syringe, Q.F., 13 and 18-pr.	1§	—	Under lower tray, small stores.
Tools, packing gland, Q.F., 18-pr., collar	1	—	Tray, small stores, upper (in round tin box).
Tools, packing gland, Q.F., 18-pr., plug	1	—	Tray, small stores, lower.
Tools, withdrawing ring supporting packing, Q.F., 13 and 18-pr..	2	—	Tray, small stores, upper.
Traces, saddlery .. .. .. pairs	2	2	On platform board.
Tugs, trace .. .. .. (spare)	4	4	On platform board.
Washers, drag, 2nd class, "C," capped wheels .. .. .. (spare)	1	1*	Under footboard, "near" side.
Washers, packing, hydraulic buffer sets (spare)	2	—	Tray, small stores, upper (in round tin box).

* Per sub-section. † Lower tray. § Per section.

AMMUNITION WAGONS.

Article.	No.	Where carried.
Blankets, G.S.	2	On top of ammunition box.
Boxes, grease, 14-lb.‖	2	Under platform board.
Cartridges, Q.F., 18-pr., shrapnel	38	In ammunition box.
Case, saw, hand	1	Lid of ammunition box.
Clips, cartridge, Q.F., 18-pr.	38	On cartridges.
Grease, lubricating .. .. .. lb.	28	In boxes.
Handspike, common, 6 feet	1	Under perch.
Implements, fuze, shell, and cartridge—		
Keys, setting fuze, T. and P., No. 80 ..	2	In tray, small stores.
Indicator fuze, Q.F., 18-pr.	1	On top of ammunition box.
Kettles, camp, oval, 12-quarts	—	Under wagon, as required.
Lashing, tarred, 1 in. × 20 feet	1†	Under wagon, as required.
Lashing, tarred, 1 in. × 10 feet	1†	Under wagon, as required.
Nut, actuating screw, brake gear (spare)	1*	In tray, small stores.
Ordnance, Q.F., 13 and 18-pr.—		
Bush, firing hole .. .. (spare)	1*	In tray, small stores.
Pin, firing .. .. .. (spare)	1	In tray, small stores.
Pole, draught, No. 18 .. (spare)	1‡	Under perch.
Rope, picketing, 66 feet	1	On platform board.
Saw, hand, 26-in.	1	In case, saw, hand.
Spanner, No. 93	1‡	In case, side of ammunition box.
Valise, horse shoe	1¶	Front of ammunition box.
Valises, tools (shoeing, wheelers, or saddlers)	—¶	Front of ammunition box.

* Per section. † For each ammunition wagon carrying a spare No. 18 pole.
‡ Per sub-section. ‖ Components of wagon. ¶ *See* footnote ‖, page 54.

CARRIAGE AND LIMBER.

LIMBER.

On platform board.

1 pair drag ropes.
1 bar, supporting pole.
1 felling axe.
4 straps, trace.
4 tugs, trace.
1 swingletree.
2 pairs traces, saddlery.
2 breast pieces.
4 straps, supporting front.
2 straps, supporting rear.

---

1 box, grease, 3 lb. } *under.*
1 drag washer

1 oil can, No. 3 (mineral oil) } *under.*
1 oil can, No. 3 (Rangoon oil)

1 water-brush, *under.* Fittings for 2 rifles on front of box. 1 billhook, *under.*

On top.
4 blankets.

1 shovel, G.S.
1 key, setting fuze.*

12 rounds.	Upper tray. / Lower tray. / Sponge cloths. Syringe.†	12 rounds.

1 key, setting fuze.*
1 shovel, G.S.

6 canvas buckets, *under.* 6 canvas buckets, *under.*

1 pickaxe, *under.*
1 key spring lock, in pocket.

Contents of upper tray.

1 catch retaining breech screw.
1 drift.
1 driver, screw.
1 gauge, striker protrusion, No. 1.
pins, keep, split, various.
2 rings, packing.
1 striker.
6 screws, lubricating.
springs:
2 main.
2 safety catch.
1 sight clinometer.
2 traversing lever.
4 trigger.
1 tripping piece.
1 stud retaining stuffing box.
1 tool, packing gland, collar.
2 tools, withdrawing ring.
2 sets washers, packing.

Contents of lower tray.

1 collar adjusting wheels.
3 files.
1 key, fixing fuze.
1 key, pole, pin.
2 pins, keep, split, ¼ in. × 5 in.
1 pin, capsquare.
1 pin, locking shield pawl.
2 springs, disc, No. 62.
1 tool, packing gland plug.
1 handle, file, small.
1 pin, linch.
2 keys, setting fuze.
1 pin, pole.
2 plugs, filling hole.
1 spring, shield pawl
2 springs, firing gear

CARRIAGE.

1 setter, fuze, in case
1 dial sight, in case } on shield.
2 keys, setting fuze, in case

† 1 clinometer, field (in case) } on shield.
1 clinometer, sight (in case)
1 telescope (in case) on axletree.

Contents of tool case (on axletree).

1 brush, breech screw.
1 funnel.
1 hammer.
1 pair pliers.
1 lanyard, firing.
spanners:
1 McMahon, 15-inch. †
1 McMahon, 9-inch.
1 No. 244.
1 hyd. buffer No. 121.
1 hyd. buffer No. 123.
1 hyd. buffer No. 129.
1 tool, withdrawing split pins.

---

1 can, lubricating, No. 9, on shield.

1 cleaner, plasaba } in tubular trail.
1 cleaner, wool
1 cover, breech } on front of shield when not on gun.
1 cover, muzzle
2 aiming posts, on front of shield.

---

* When the guns are parked, the fuze keys should be placed in the tray of the ammunition box.
† 1 per section.

B

WAGON AND LIMBER

LIMBER.

On platform board.

1 pair drag ropes.
1 bar, supporting pole.*
1 apparatus, adjusting running out springs and cover. †
4 straps, trace.
1 swingletree.

2 pairs traces, saddlery.
2 breast pieces.
4 straps, supporting front.
2 straps, supporting rear.
4 tugs, trace.
2 shovels.

1 box, grease, 3 lb. } *under.*
1 drag washer* }

1 oil can, No. 3 (mineral oil) } *under.*
1 oil can, No. 3 (Rangoon oil) }

1 water brush, *under.* Fittings for 2 rifles on front of box. 1 billhook, *under.*

On top
2 blankets.

1 key, setting fuze.‡ (left side)

38 rounds.
Tray.
Holder, cartridge.§
Sponge cloths.

1 key, setting fuze.‡ (right side)

3 canvas buckets, *under.* 3 canvas buckets, *under.*

1 pickaxe, *under.*
1 key, spring lock, in pocket.

Contents of tray.

1 collar, adjusting wheels.*
1 driver, screw.
1 pin, linch.*
1 pin, pole.*
1 } keys { fixing fuze.
1 } keys { primer.*
1 } keys { pole pin.*
2 } keys { setting fuze.
4 primers, percussion, in tin box.

WAGON.

under
1 jointed pole.* with 2 lashings.
1 handspike, common.

1 box, grease, 14 lb., *under.*

Bag, tool ‖
Valises. ‖
1 rope, picketing, 66 ft.

1 box, grease, 14 lb., *under.*

On top.
2 blankets.

1 key, setting fuze.‡
1 spanner, No. 93.* (left side)

38 rounds.
Tray.

1 key, setting fuze.‡ (right side)

1 saw, hand, in case.
1 fuze indicator, on top.

Camp kettles, *under.*

Contents of tray.

1 bush, firing hole.§
2 keys, setting fuze.
1 nut, actuating screw, brake gear.§
1 pin, firing.

---

* Per sub-section.
† Per battery, carried in "A" sub-section.
‡ When the guns are parked, the fuze keys should be placed in the tray of the ammunition box.
§ Per section.
‖ Valises :—

	1 on each ammunition wagon body.	Sub-sections.
Horseshoe	1st and 2nd line	A to F.
Tools, saddlers No. 1	1st line	A, C, and E.
Tools, shoeing ...	1st line	A, C, D, and F.
Tools, fitters or wheelers No. 1	2nd line	B, D, and F.

ALTERATIONS

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

2/32. 08

ORDNANCE, Q.F., 18 PR. MARKS I, I* AND II.

STEEL, 9 CWT

SCALE = 1/12.

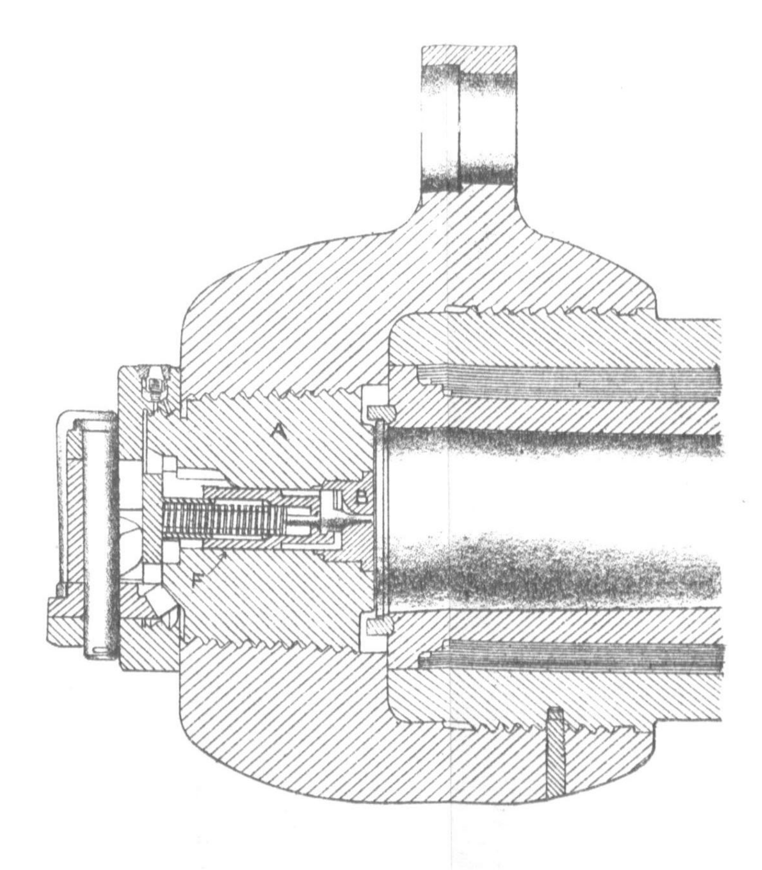
32·62 (28 CALS) LENGTH OF BORE

3·3

96·96 TOTAL LENGTH.

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Plate I.



Ordnance, Q.F. 18 Pr.

General Arrangement of Breech Mechanism.

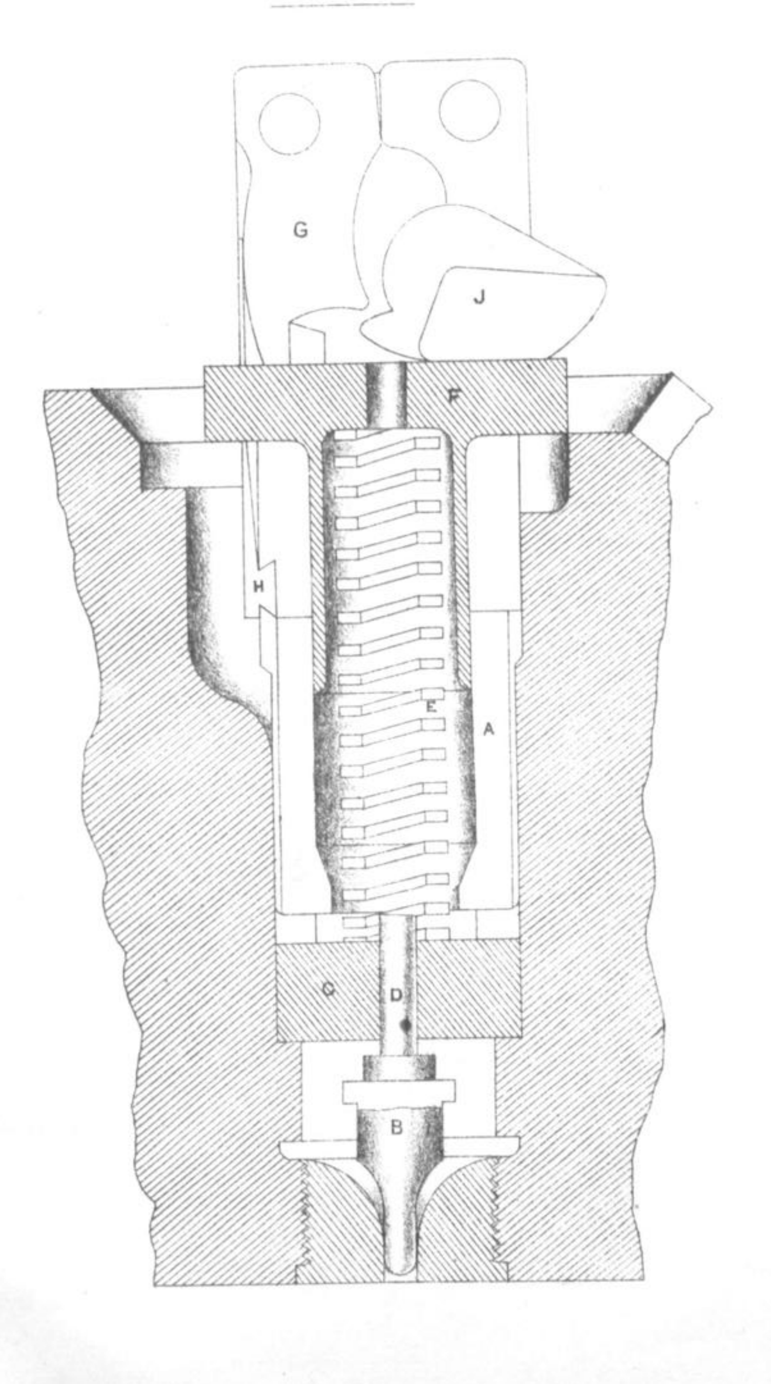
Scale = 1/4.

A... Breech screw.
B... Firing hole bush.
C... Carrier.
D... Breech mechanism lever.
E... Firing lever.
F... Striker.
G... Trigger.
H... Extractor.
J... Striker guide block.
K... Safety catch.

ORDNANCE, Q.F. 18 P^R.

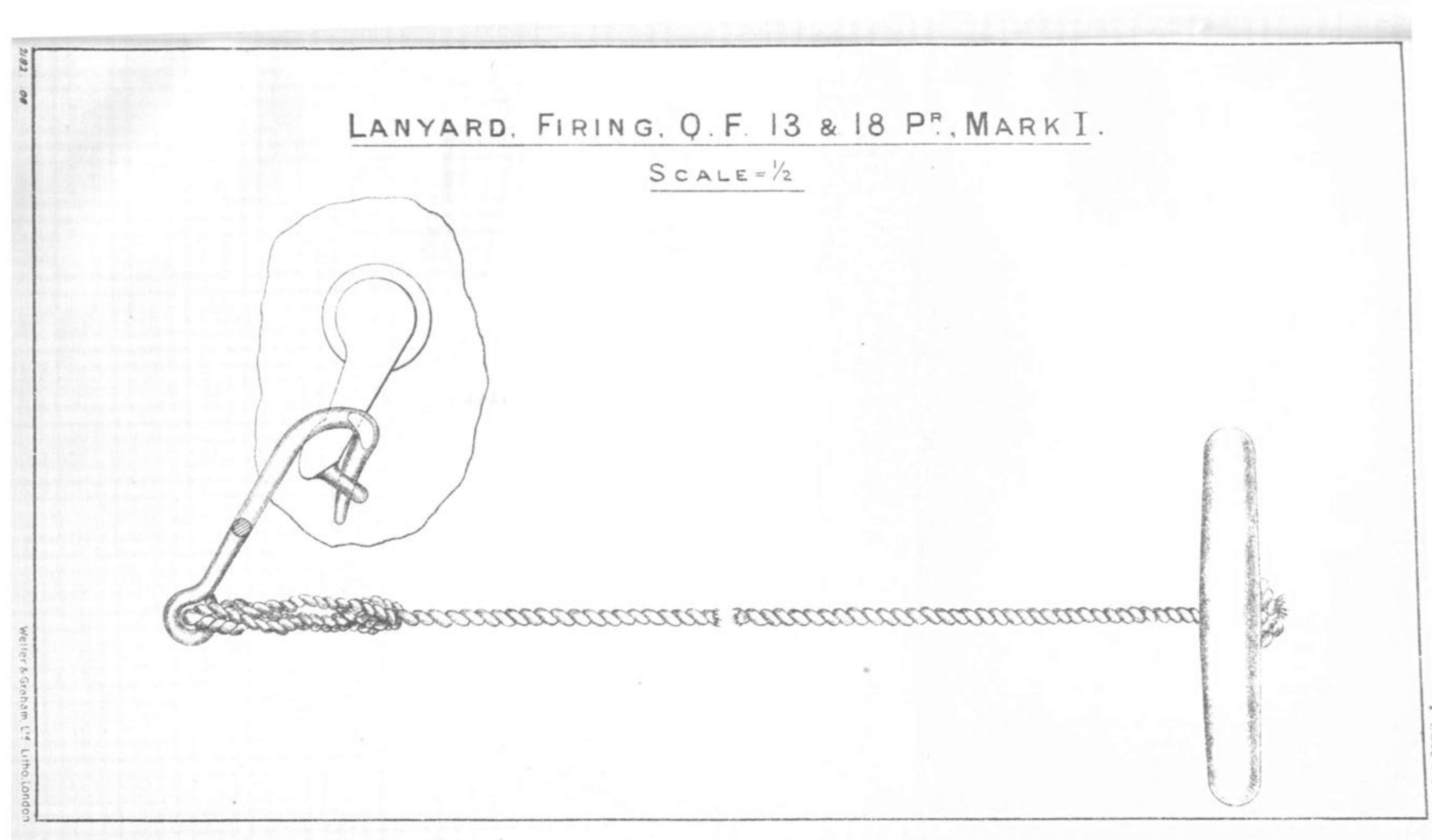
STRIKER.

SCALE=1/1



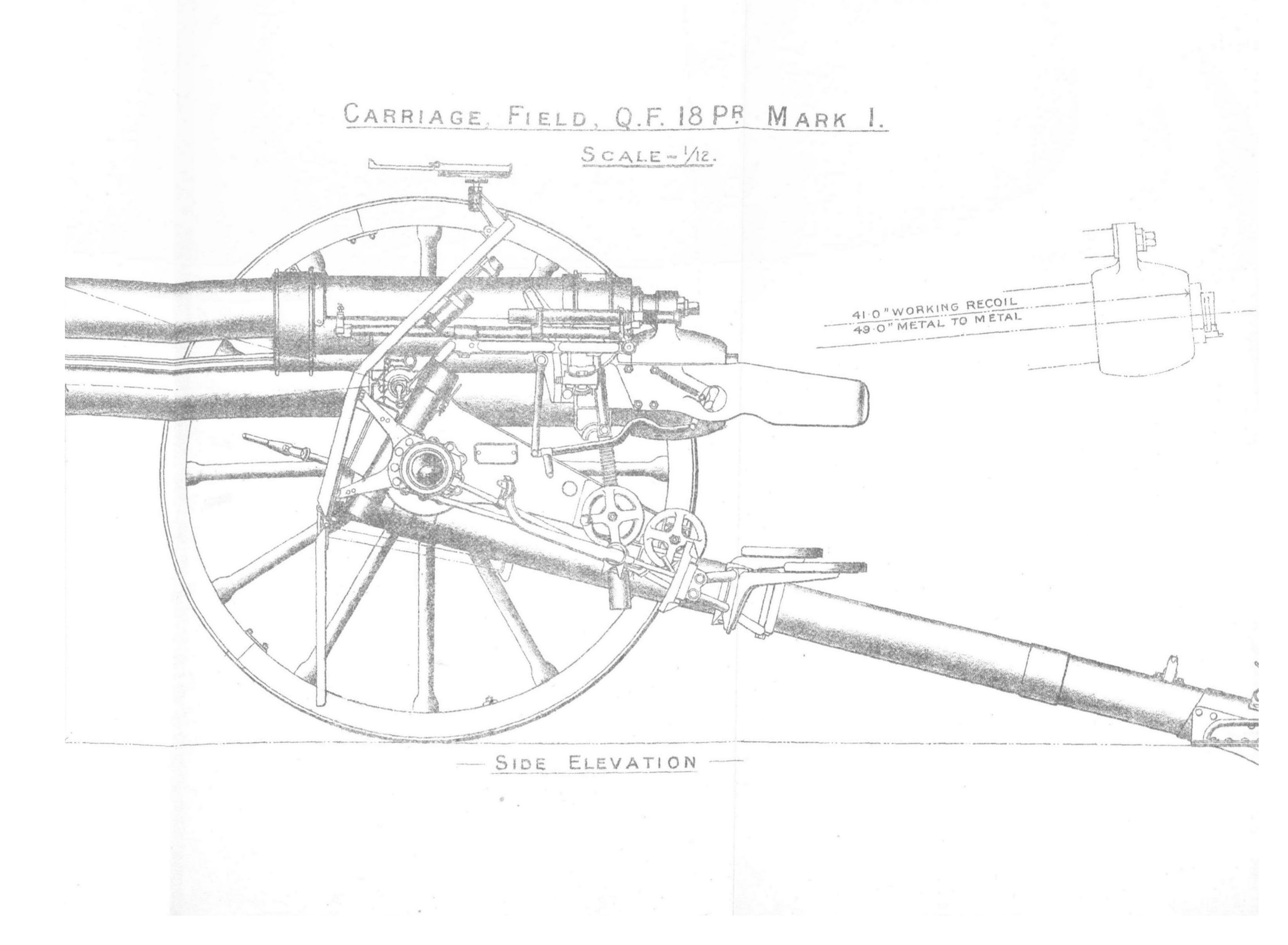
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Plate IV.


LANYARD, FIRING, Q.F. 13 & 18 PR., MARK I.
SCALE = 1/2
2182. 08
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Carriage, Field, Q.F. 18 Pr. Mark I.

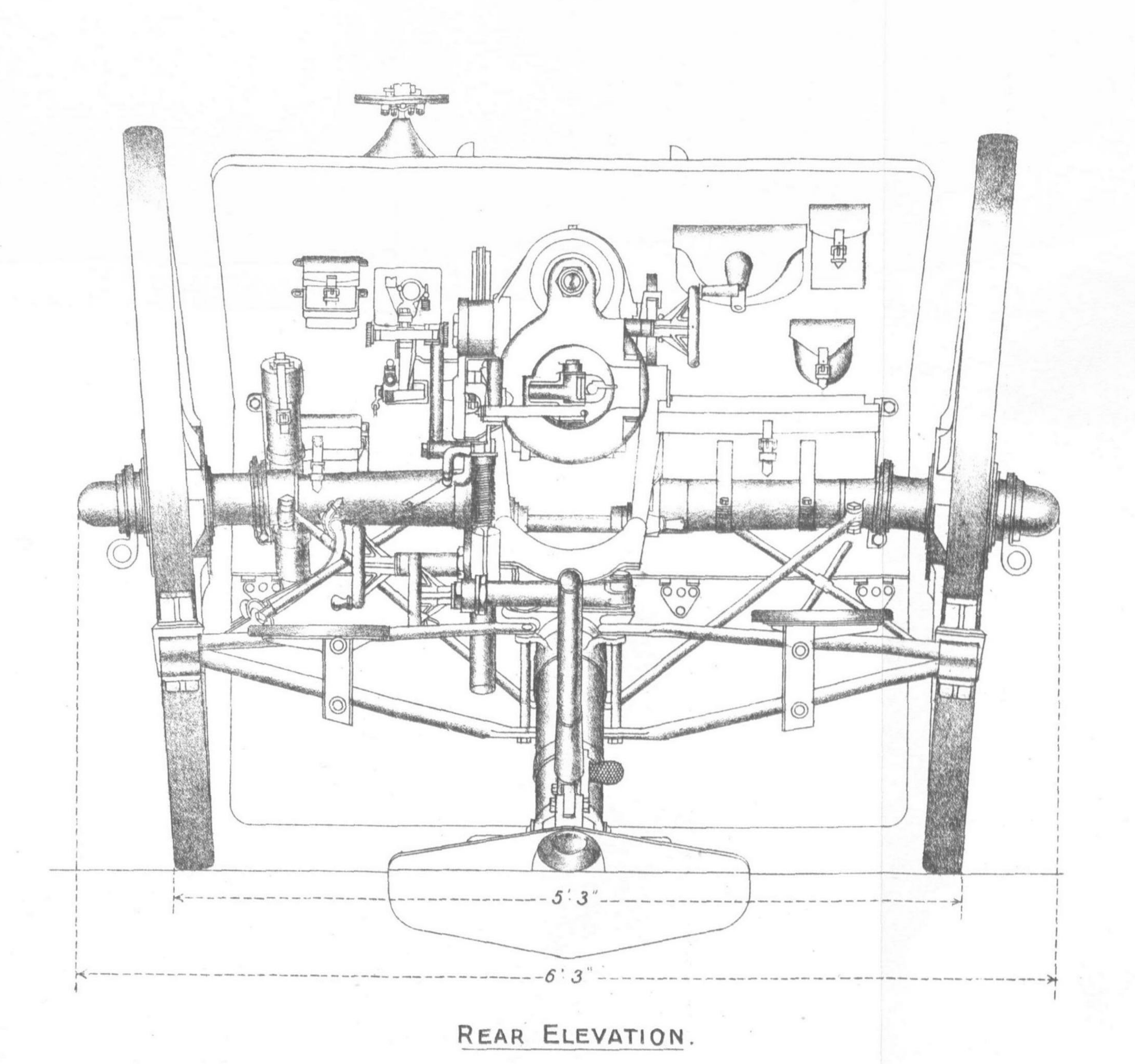
Scale - 1/12.



Side Elevation

Carriage, Field, Q. F. 18 Pr. Mark I.

Scale = 1/12.



Rear Elevation.

CARRIAGE, FIELD, Q.F., 13 P^R., MARK I.

SECTIONAL ELEVATION OF HYDRAULIC BUFFER, AND SPRING CASE.

SCALE = 1/4

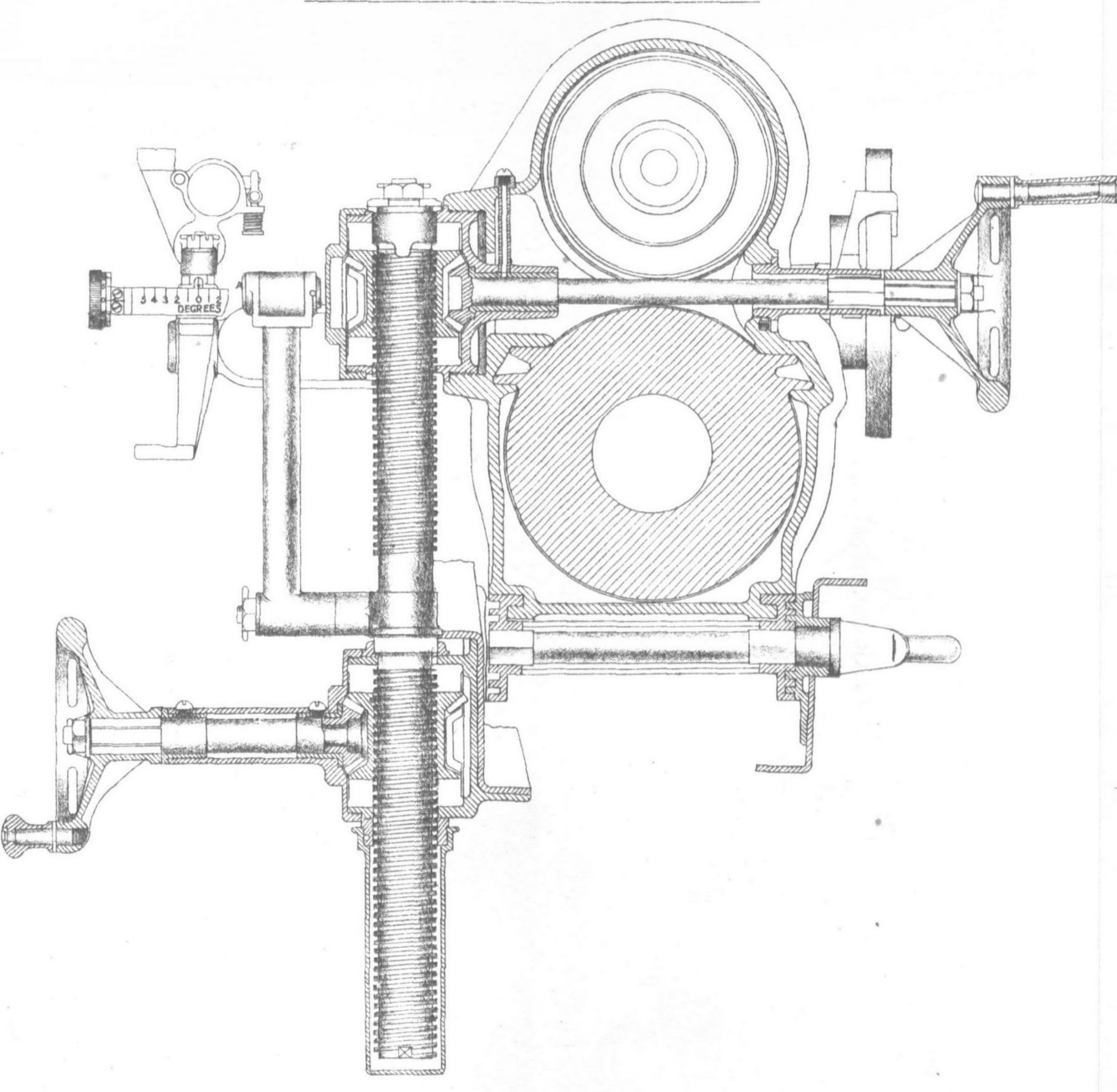
Carriage, Field. Q. F., 18 Pr. Mark I.

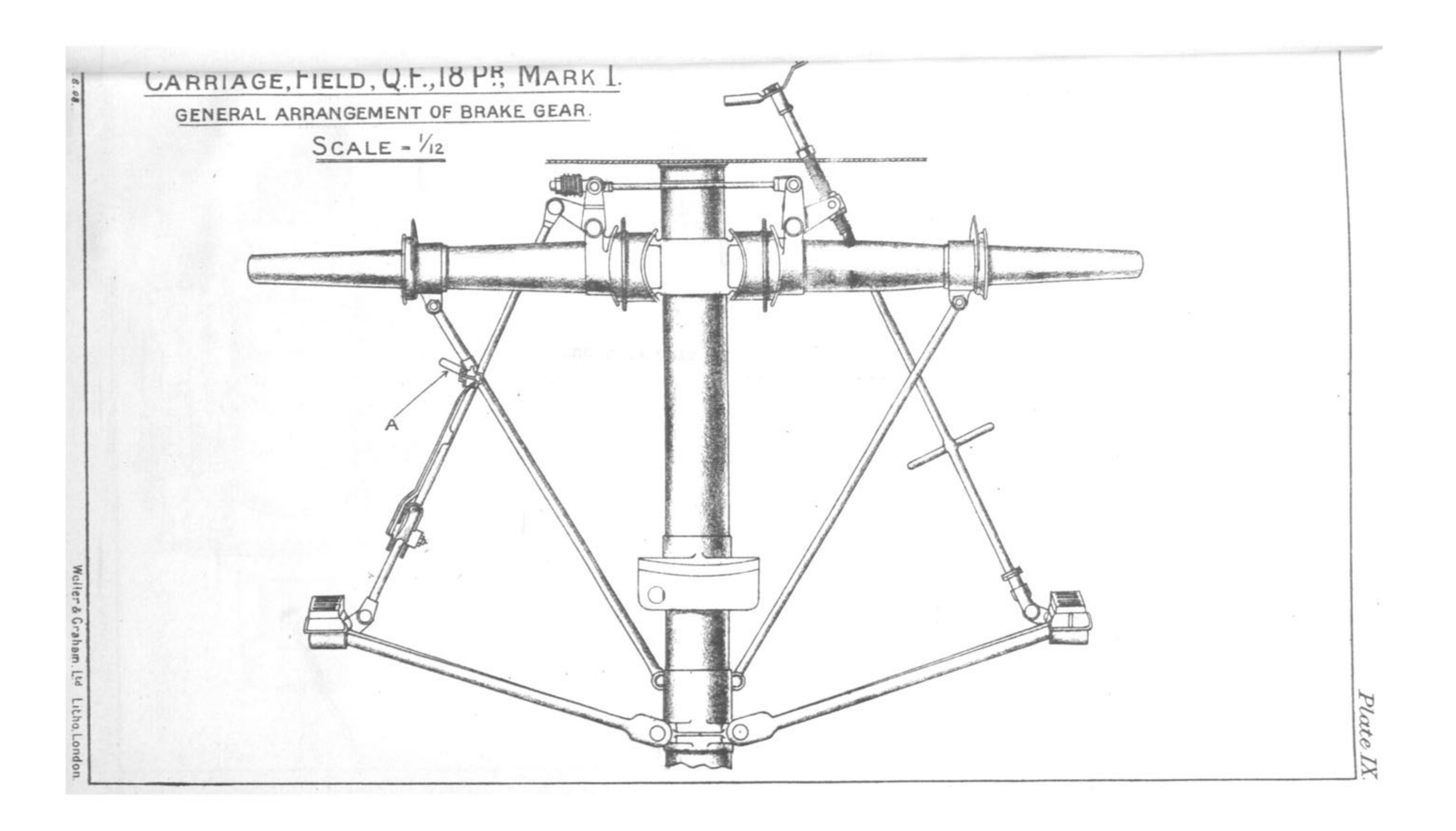
General Arrangement of Elevating, Clamping and Range Gear.

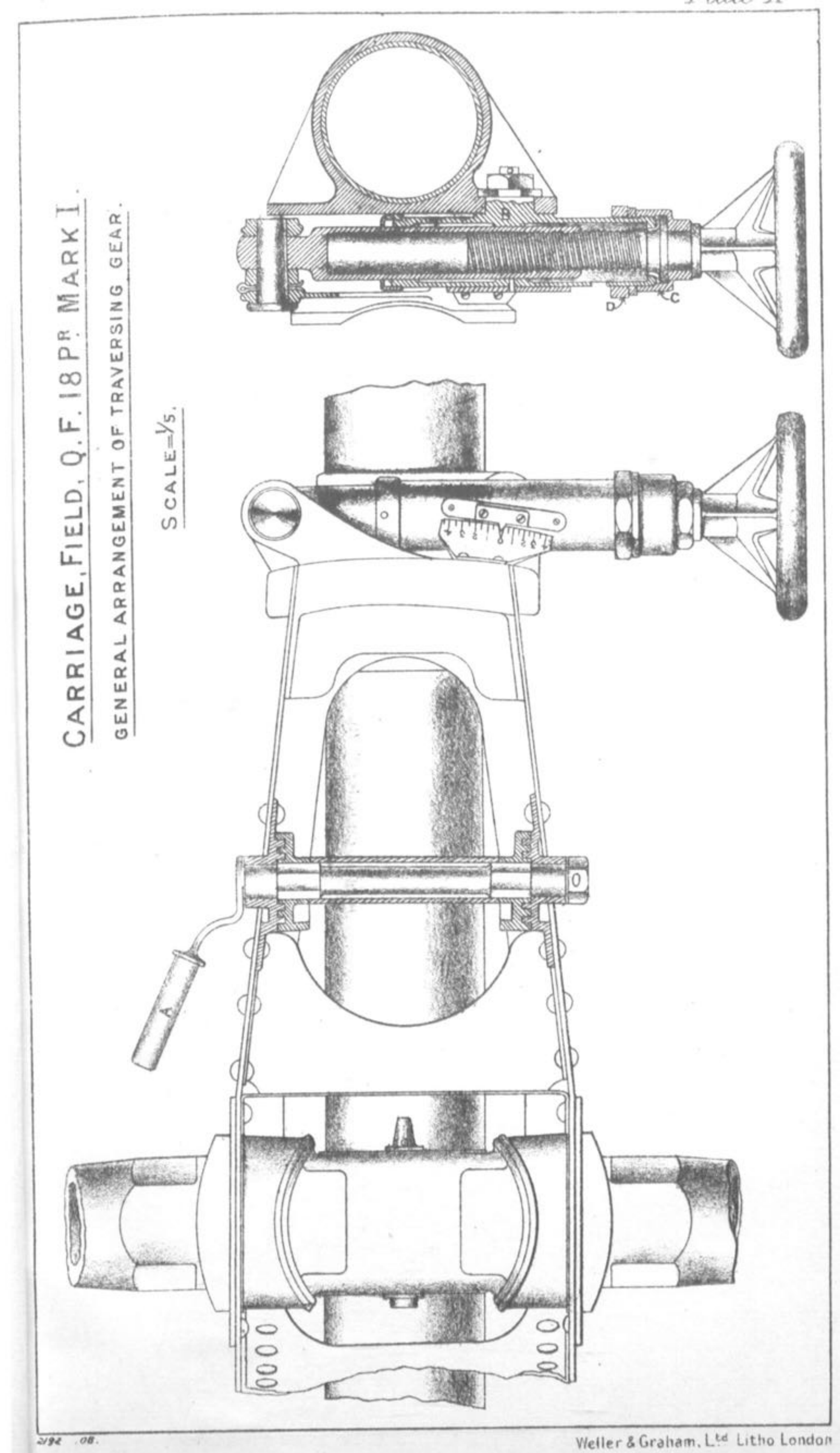
Scale = 1/5

Cross Sectional Elevation

With Gun and Sights at 16° Elevation




CARRIAGE, FIELD, Q.F., 18 PR., MARK I.
GENERAL ARRANGEMENT OF BRAKE GEAR.
SCALE - 1/12
A
Weiler & Graham. Ltd Litho. London.



2192 .08.
Weller & Graham, Ltd Litho London

Carriage, Field, Q.F., 18 Pr. Mark I.

General Arrangement of Rocking Bar Sight with Sight Clinometer in Position.

¾ ½ ¼ 0 1 2 3 4 5 6 INCHES.

A

DEP.

ELEV.+

Weller & Graham, Ltd. Litho

+ LIMBER, Q.F., 18 PR. CARRIAGE, MARKS I AND II.

SIDE ELEVATION.

INS 12 9 6 3 0 1 2 3 FEET

WHEE 4' 8" DIAM.

5' 4".5

14' 2"

+ SEE FOOTNOTE + PAGE 13.

2192 08

Weller & Graham Ltd. Litho London

+ Limber, Q.F., 18 Pr., Carriage, Marks I and II.

Rear Elevation.

INS. 12 9 6 3 0 1 2 3 FEET

4' 9"

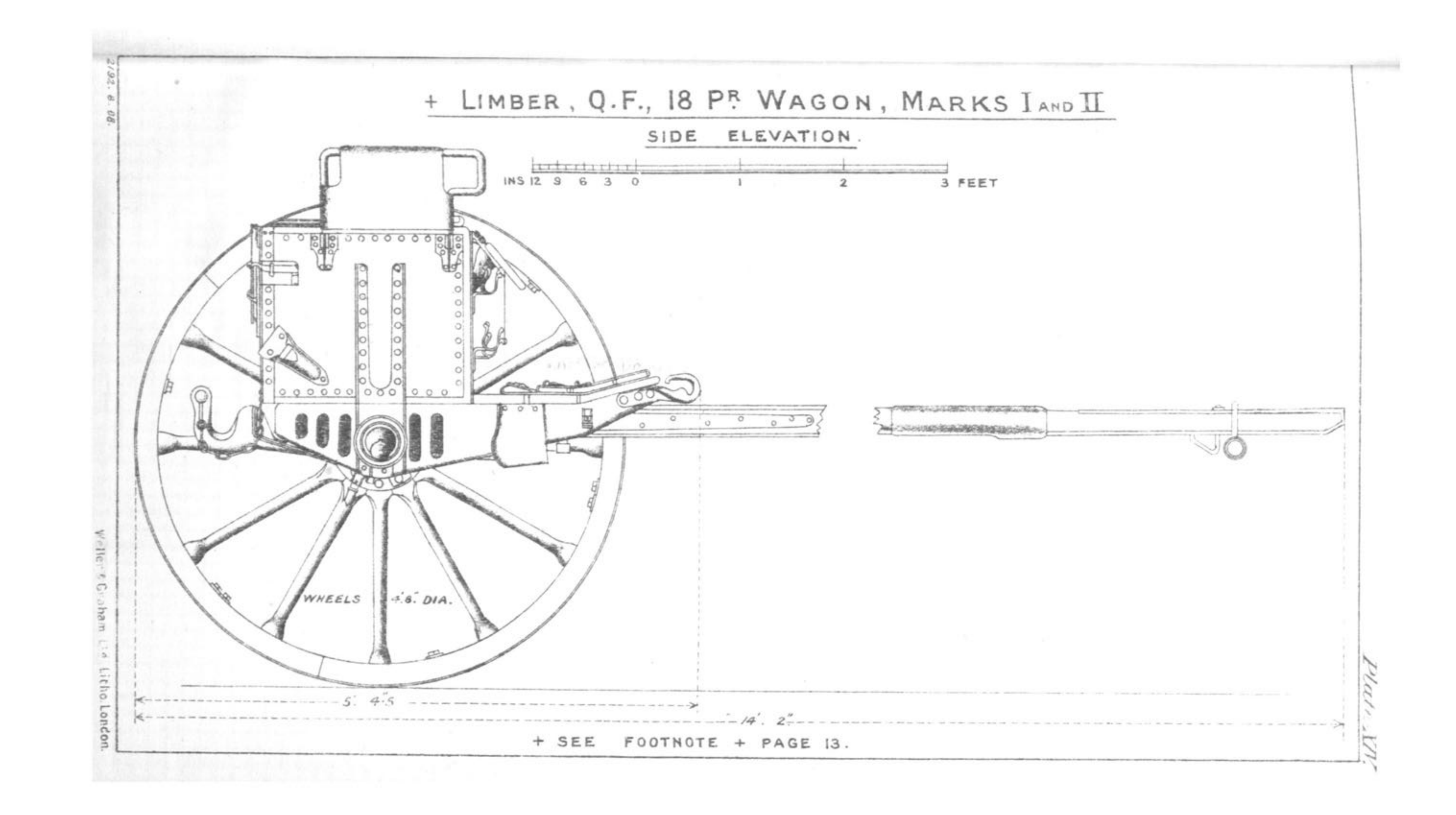
5' 3"

6' 3"

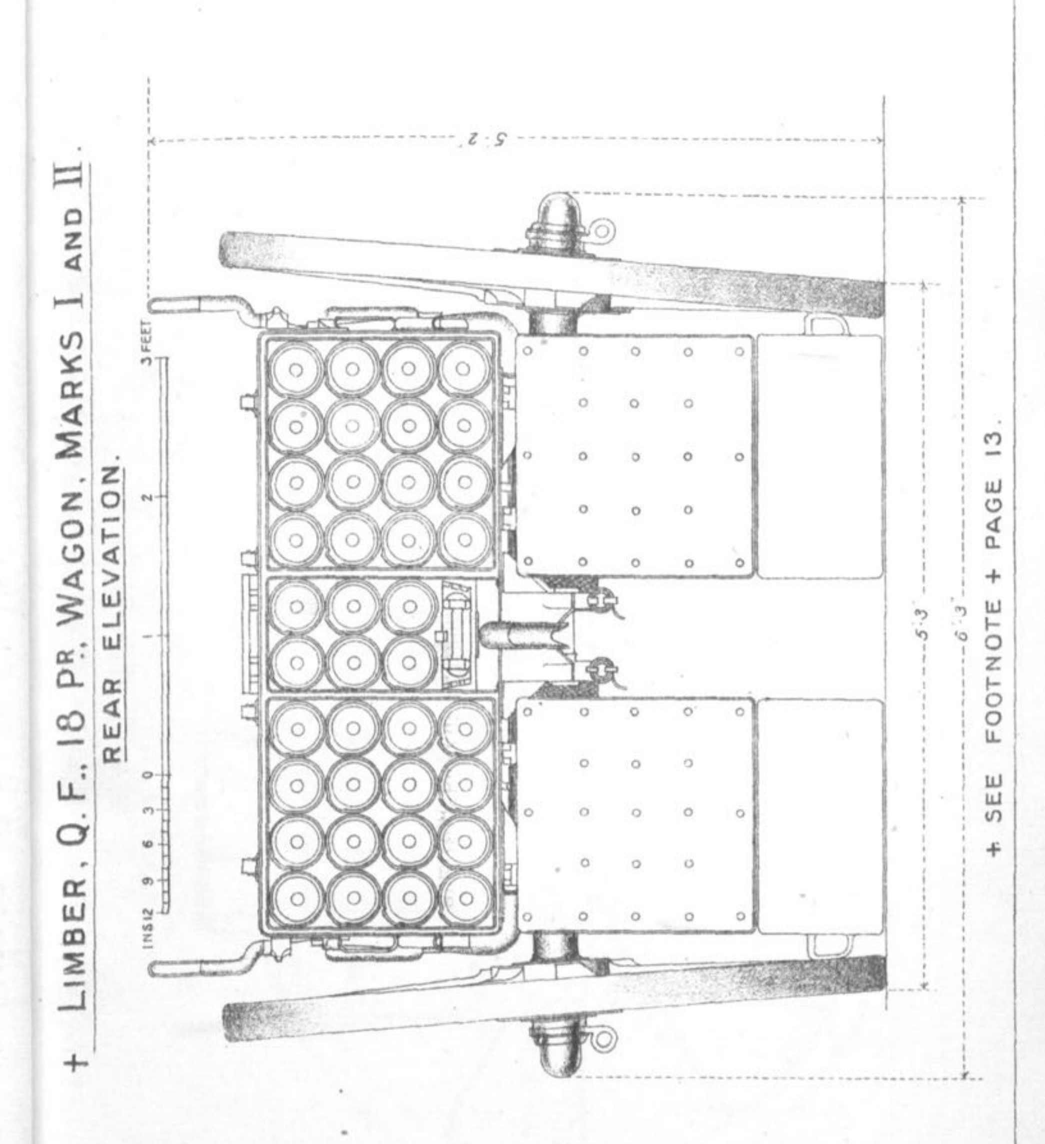
+ SEE FOOTNOTE +, PAGE 13.

2132. 8. 08.

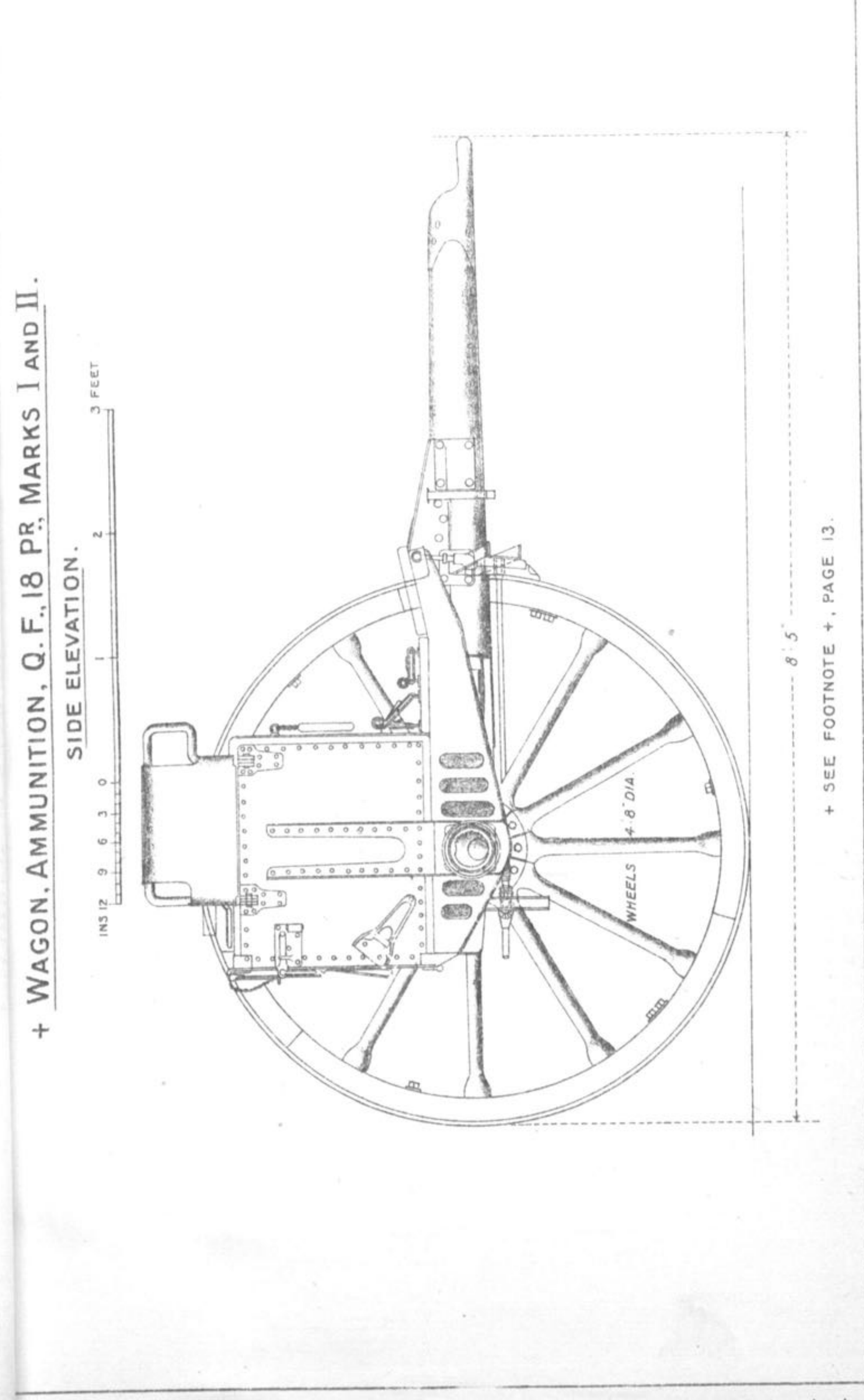
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2192. 6. 08.
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32 09
Weller & Graham, Ltd Litho. London.



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+ WAGON, AMMUNITION, Q.F., 18 PR., MARKS I AND II.

REAR ELEVATION.

+ SEE FOOTNOTE PAGE 13.

Wetter & Graham Ltd. Litho London

SIGHT, DIAL, No. 1, MARK II.

— SCALE = 1/3. —

— SIDE ELEVATION —

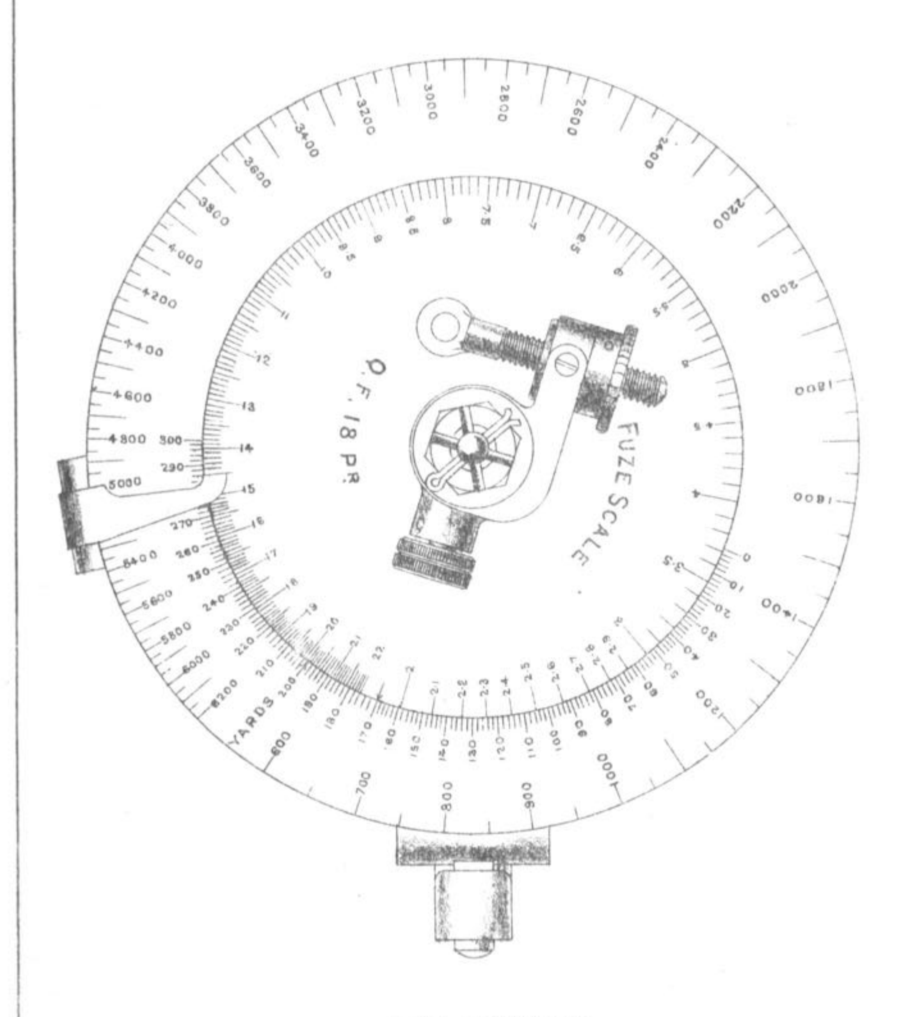
— REAR ELEVATION. —

2182. 08

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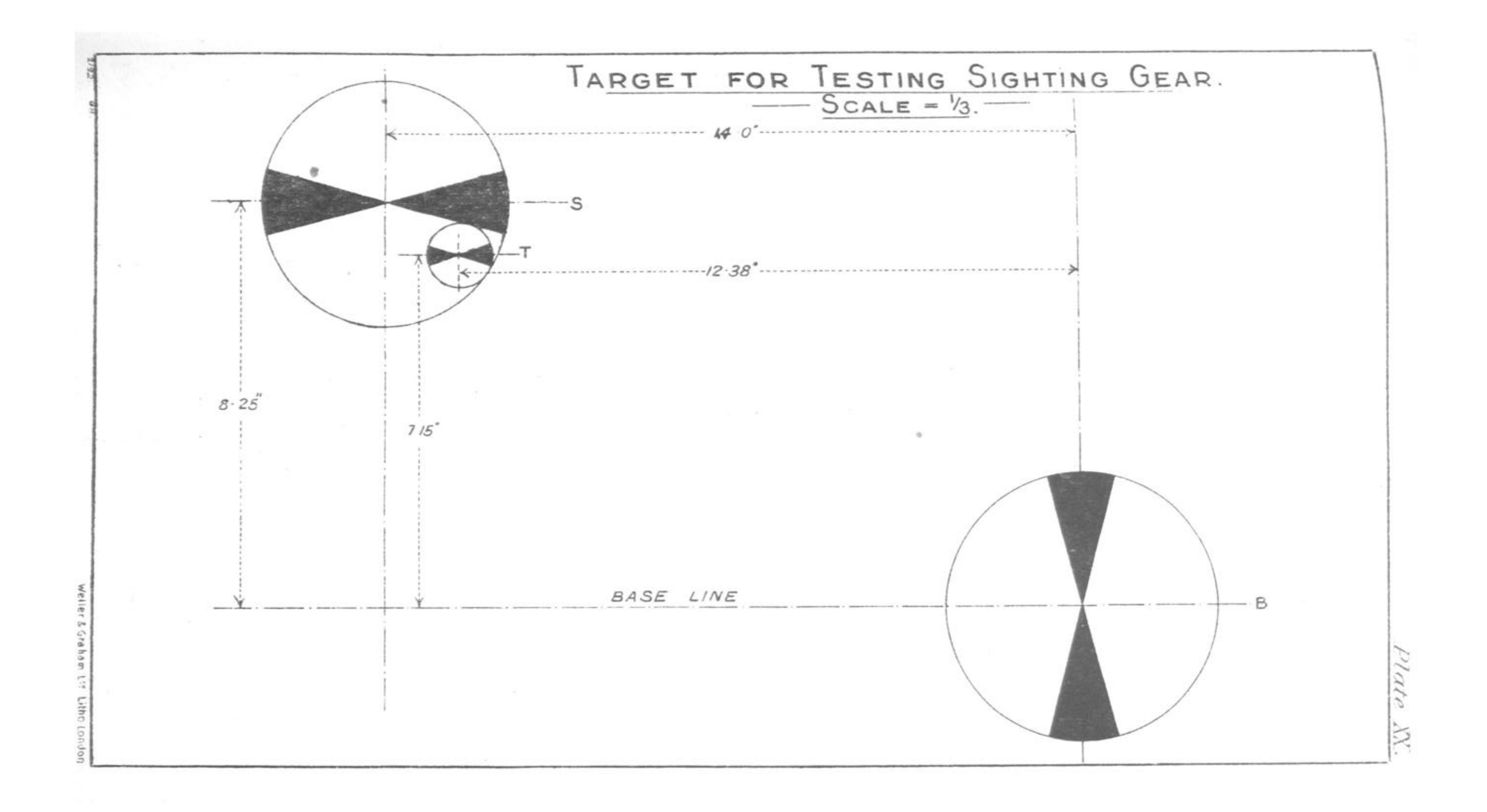
INDICATOR, FUZE, Q.F. 18 PR. MK. I.

SCALE = 1/2.



NOW READING:—

RANGE	5,000 YDS
CORRECTOR SETTING	170
FUZE	14·5



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CARTRIDGE, Q. F. 18 P^R SHRAPNEL, MARK I.

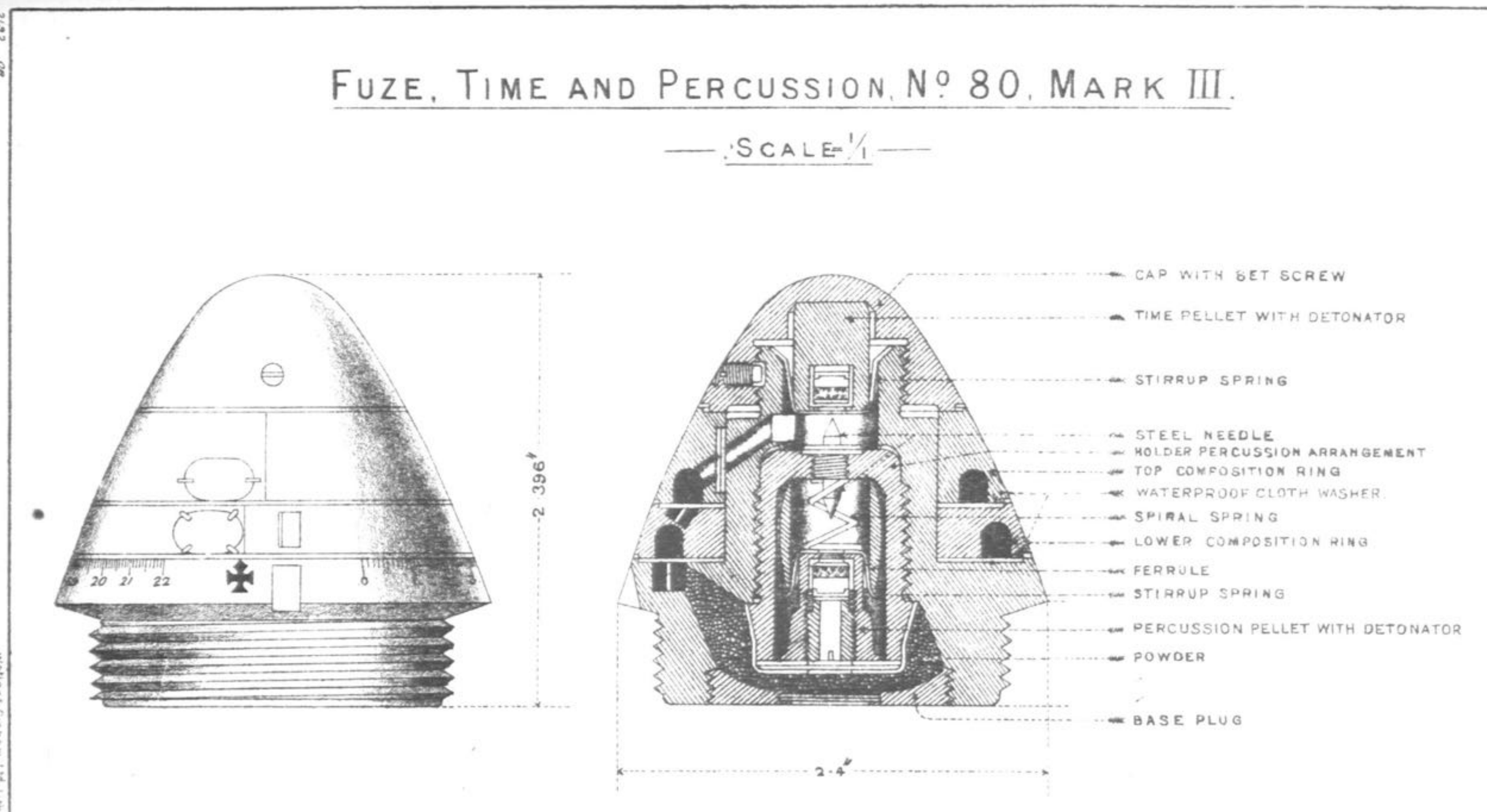
SCALE – 1/3.

COVER, FUZE T & P Nº 80.
FUZE, T & P Nº 80.
POWDER PELLETS
METAL BALLS
BODY
BURSTING CHARGE
SHALLOON BRAID
CORDITE
CASE
SILK SEWING
PRIMER
22·445"
22·538"
4·08"

2132 . 08
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Fuze, Time and Percussion, No. 80, Mark III.

Scale = 1/1

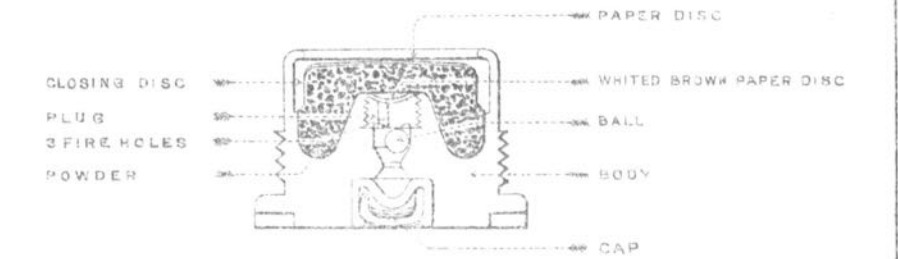


2/32 08
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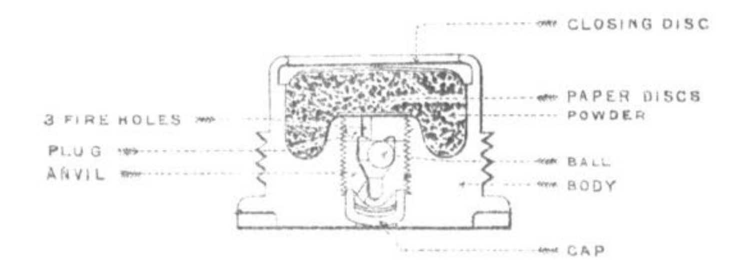
CARTRIDGE, Q.F. 13 AND 18 PR.
PRIMER, PERCUSSION.

SCALE = 2/1

MARK I.*



MARK II.



Weller & Graham Ltd. Litho London.

IMPLEMENTS, FUZE, SHELL & CARTRIDGE.

SCALE = 1/3.

KEY, SETTING, FUZE, TIME AND PERCUSSION, No. 80, MARK II.

STEEL.

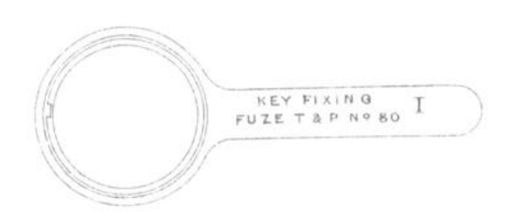




KEY, FIXING, FUZE, T & P. No. 80. MARK I.

STEEL.





KEY, PRIMER, Q.F. 13 & 18 PR. MARK I.

STEEL.

KEY PRIMER Q.F.
13 & 18 PR.

2132 C8

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HANDBOOK

OF THE

18-PR. Q.F. GUN

LAND SERVICE.

(1910.)

(REPRINTED WITH AMENDMENTS 1914.)

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HANDBOOK

OF THE

18-PR. Q.F. GUN.

LAND SERVICE.

1913.

(*Reprinted, with Amendments,* 1914.)



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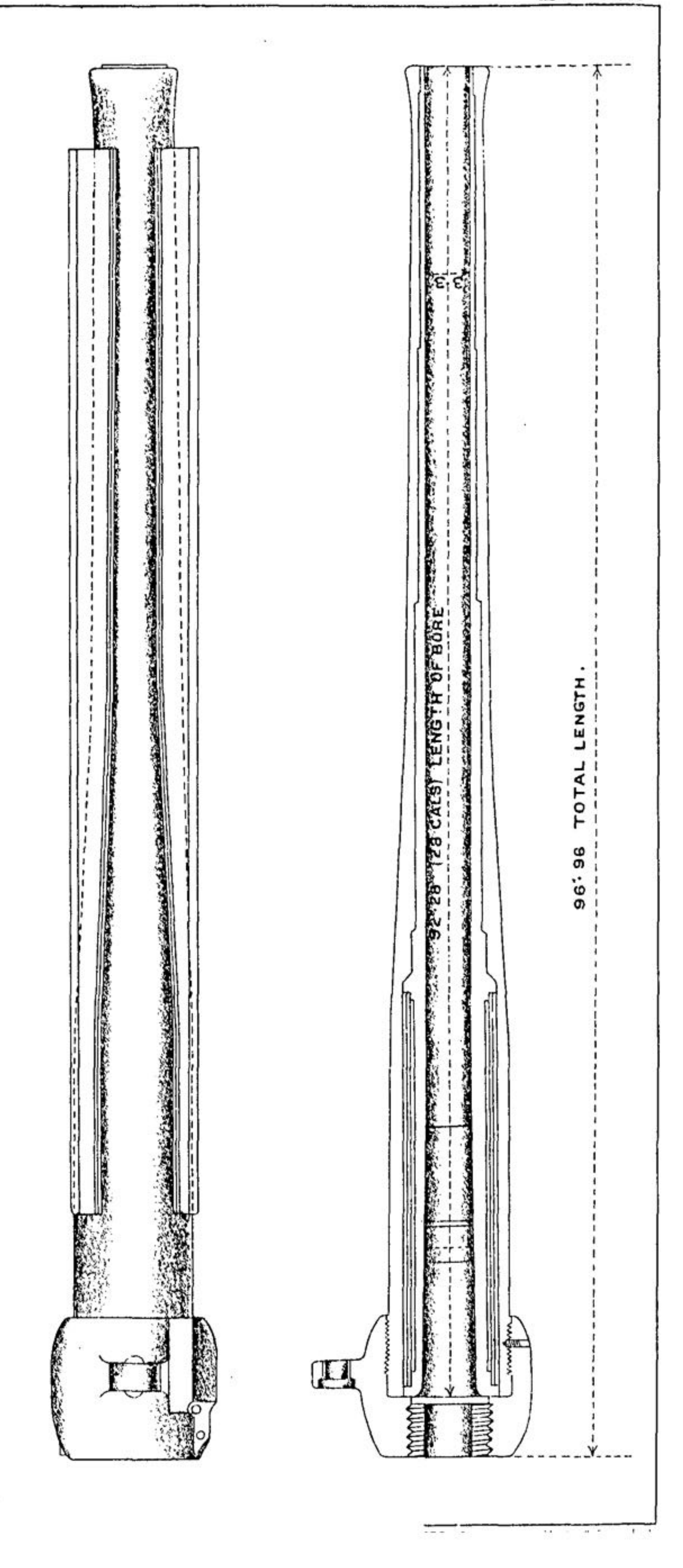
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CONTENTS.

PLATES.

N.B.—*This book is corrected up to February,* 1913. *Any alterations which may be suggested should be forwarded direct to Chief Inspector, Royal Arsenal, Woolwich.*


ORDNANCE, Q.F., 18 PR. MARKS I, I* AND II.
SCALE = 1/12.
3.3
92.28 (28 CALS) LENGTH OF BORE
96.96 TOTAL LENGTH.

HANDBOOK

OF THE

18-PR. Q.F. GUN.

GUNS.

Material			Steel (wire construction).
Weight (with breech fittings)			9 cwt.
Length, total			96·96 inches.
Bore,	calibre		3·3 inches.
	length (to face of breech screw)		92·62 inches.
Rifling,	system		Polygroove, modified plain section.
	length		80·232 inches.
	twist		Uniform, 1 turn in 30 calibres.
	grooves,	number	18.
		depth	·04 inch.
		width	·384 inch.
Firing mechanism			Percussion.

Gun Body, Mark I.

(*Plate I.*)

The gun is made of steel, and consists of the "A" tube, a series of layers of steel wire, jacket, and breech ring. The "A" tube extends from the rear end of the chamber to the muzzle. Over a portion of the "A" tube are wound successive layers of steel wire. The jacket is fitted over the exterior of the wire and "A" tube, and is secured longitudinally by corresponding shoulders and the breech ring, which is screwed over the jacket at the rear, and secured by a set screw. The breech ring is prepared for the reception of the breech mechanism, and is provided on the upper side with a lug for the attachment of the hydraulic buffer. Longitudinal projections on each side of the jacket form guides for the gun when in the cradle of the carriage.

Gun Body, Mark I*.

Mark I* guns are Mark I guns repaired by the renewal of the "A" tube.

The repair consists in fitting into the old jacket under hydraulic pressure, a new "A" tube with new wire winding. The exterior of

the "A" tube with its wire is slightly tapered, and the interior of the jacket is bored to correspond.

Gun Body, Mark II.

(*Plate I.*)

Mark II guns differ from Mark I as follows:—

The exterior of the "A" tube is slightly conical, the interior of the jacket being coned in a corresponding manner to admit of the guns being built up by means of hydraulic pressure instead of by shrinkage.

Gun Bodies, Marks I, I* and II.

The chamber is slightly coned throughout its length, to facilitate the extraction of the cartridge.

A plane for clinometer is prepared on the upper surface of the breech ring.

An axis line is cut at the breech on the right side. Vertical and horizontal lines are also cut on the muzzle face and horizontal lines on the breech face.

Breech Mechanism.

(*Plate II.*)

The guns are fitted with "Single Motion Breech Mechanism." The mechanism is so arranged that by one pull on a lever the breech is unlocked and the screw and carrier are swung into the loading position. After loading, one thrust on the same lever inserts the breech screw into the breech opening and turns it into the locked position.

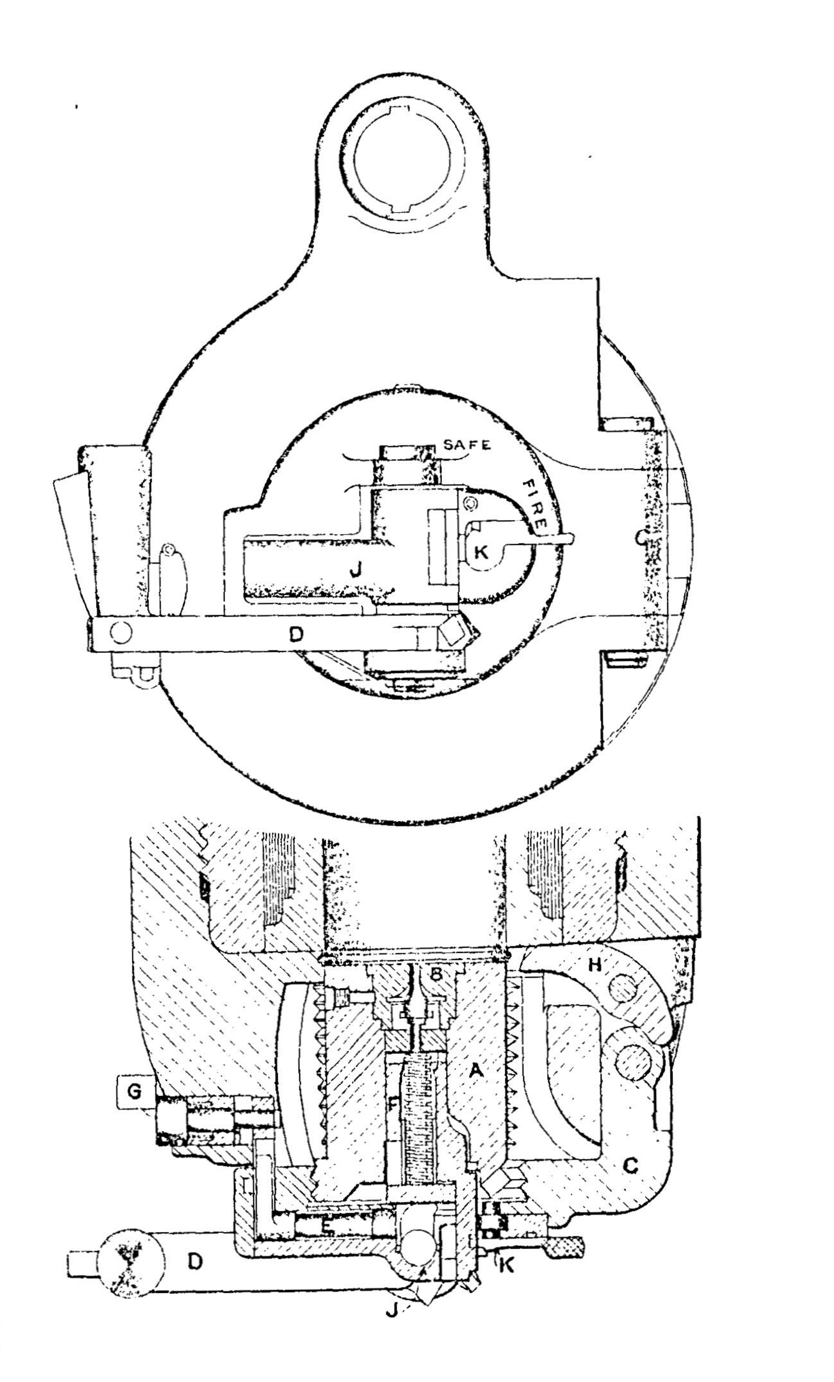
Breech Closing Mechanism.

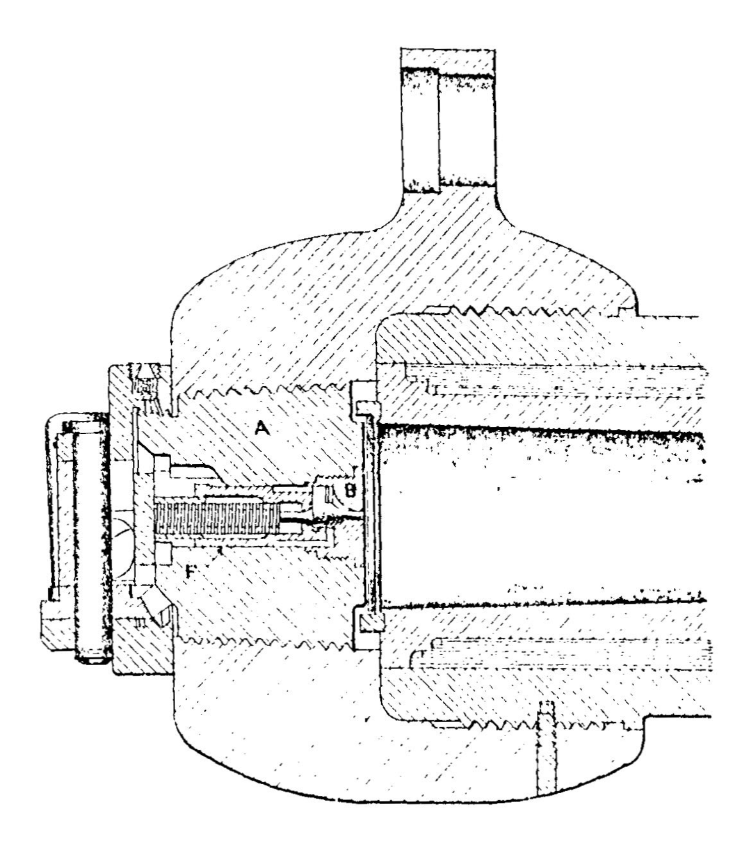
The breech is closed by a steel screw tapering towards the rear. Segments of the screw thread are removed from opposite sides of the screw, and the breech opening of the gun being prepared in a corresponding manner, admits of the screw being locked in the gun by the fourth of a turn.

The screw is provided on the rear end with left hand screw threads which engage with corresponding screw threads in the inner face of the carrier.

The carrier for supporting the breech screw, when withdrawn from the gun, consists of a steel arm hinged to the right side of the gun at the breech. It is prepared on the inner face for the reception of the breech screw, and on the outer face with a recess for the striker guide block and two lugs for the hinge bolt of the breech mechanism lever. A steel catch with spiral spring is fitted to the interior of the carrier and serves to retain the breech screw in the open position. The catch is automatically released in closing the breech.

Hinged to the rear face of the carrier is a breech mechanism lever, provided with bevel teeth which engage with corresponding teeth on the rear face of the breech screw, so arranged that when the lever is pulled to the right, the first movement of the lever unlocks the breech screw, and on continuing the motion, the screw and carrier are swung into the loading position.



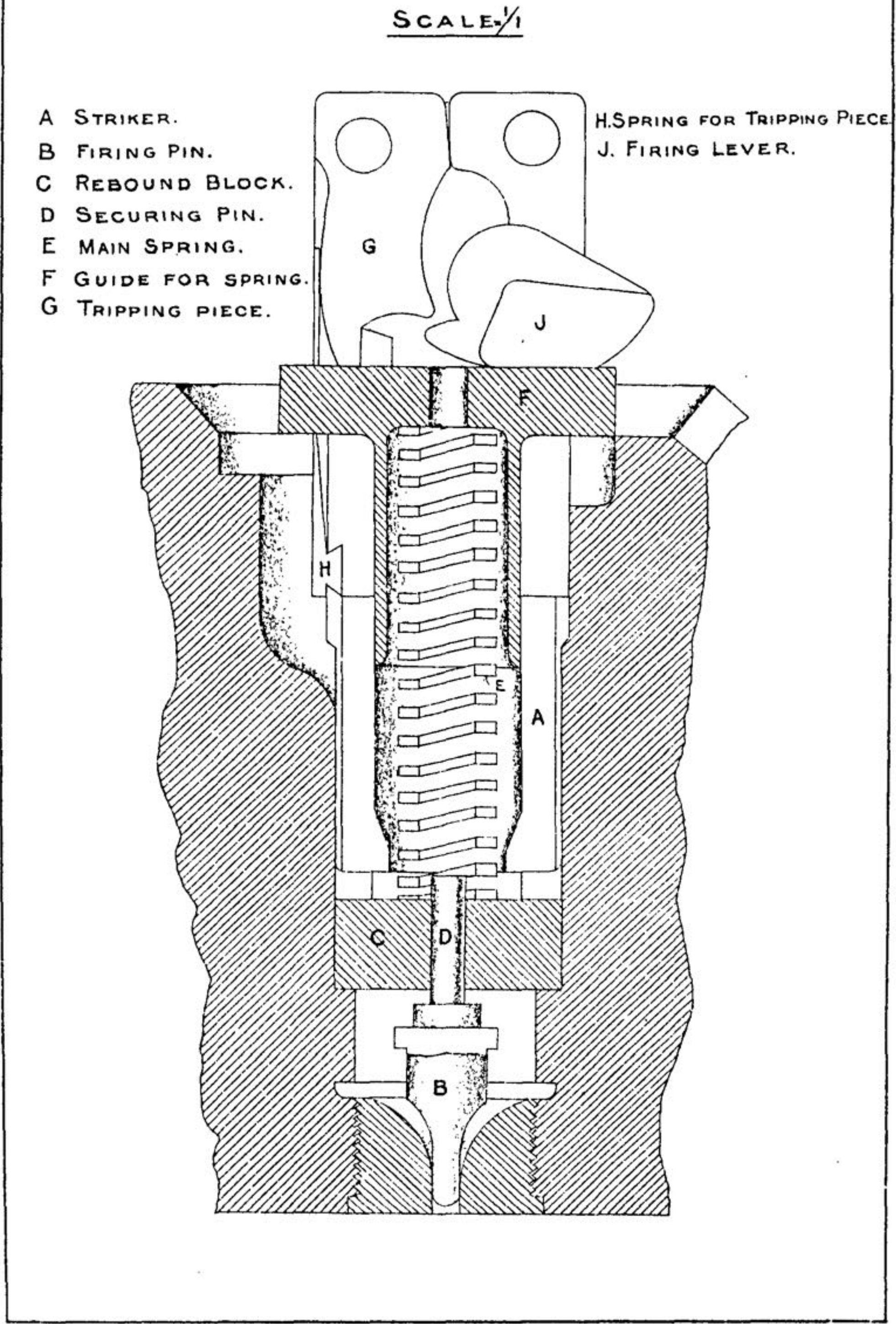


ORDNANCE, Q.F. 18 PR.

GENERAL ARRANGEMENT OF BREECH MECHANISM.

SCALE ¼.

A. BREECH SCREW.	F. STRIKER.
B. FIRING HOLE BUSH.	G. TRIGGER.
C. CARRIER.	H. EXTRACTOR.
D. BREECH MECHANISM LEVER.	J. STRIKER GUIDE BLOCK.
F. FIRING LEVER.	K. SAFETY CATCH.


ORDNANCE, Q.F 18 PR.
STRIKER.
SCALE 1/1
A STRIKER.
B FIRING PIN.
C REBOUND BLOCK.
D SECURING PIN.
E MAIN SPRING.
F GUIDE FOR SPRING.
G TRIPPING PIECE.
H. SPRING FOR TRIPPING PIECE.
J. FIRING LEVER.
G
J
F
H
E
A
C
D
B

The breech mechanism lever is retained in the closed position by means of a catch with flat spring, pivoted in the lever, one end of which engages a recess in the lower lug on the rear face of the carrier.

Firing Mechanism.

(*Plate III.*)

The firing mechanism is for percussion firing, and is so arranged that the gun cannot be fired before the breech screw is locked and the breech mechanism lever home.

It consists of a striker with firing pin, rebound block and securing pin, main spring, guide for spring, and tripping piece with flat spring and fixing screw, fitted through the centre of the breech screw and retained in position by the striker guide block on the carrier. A steel firing lever in the interior of the striker guide block, serves to cock the striker and fire the gun, one end of the lever engaging with the tripping piece and guide for spring, and the other end with the trigger in the left side of the gun when the breech is closed.

The trigger is actuated by a direct pull on the firing gear of the carriage, thus partially revolving the firing lever, by means of which the striker is forced to the rear, and the guide for spring to the front, compressing the main spring until the projecting toe on the inner end of the firing lever slips past the front end of the tripping piece in the striker guide block, when the striker is free to go forward with momentum due to the energy stored up in the compressed main spring, and detonates the percussion primer of the cartridge.

The firing lever is returned to the firing position by means of the guide for spring.

The front end of the firing pin in the striker is withdrawn within the firing hole bush by means of a rebound block in the striker, which engages a recess in the breech screw for its reception.

A loop is provided on the lower part of the trigger for the attachment of a firing lanyard if required.

A safety catch, with flat spring, is fitted to the striker guide block for retaining the striker in the uncocked position, thus admitting of the gun being travelled with a cartridge in the bore.

Note.—The hook of the firing lanyard is of special pattern, and must be attached to the loop on the trigger as shown on Plate IV.

Should a jam occur after firing, care must be taken to see that the striker is flush with the rear end of the striker guide block before force is used to open the breech. In cases where the striker is not flush with the guide block, withdraw the keep pin and hinge bolt of the breech mechanism lever and remove the lever, guide block, firing lever, and striker from the gun. Replace the breech mechanism lever and hinge bolt, and swing the breech screw and carrier into the loading position. Replace the striker, firing lever, and guide block.

Extractor.

The extractor is of steel, and is hinged to the right side of the gun. On the inner end are two arms which clip the rim of the cartridge, the outer end forming a lug, by means of which the extractor is automatically actuated in opening the breech.

Pin, Firing, Dummy, and Screw, Breech, Dummy.

The above-mentioned fittings are provided for drill and instructional purposes, and are intended to prevent wear to the service mechanism and breech opening of gun.

The dummy firing pin differs from the service pin in not having the portion which projects through the firing hole bush.

The body of the dummy breech screw is of wood, having front and rear bronze plates, and a copper alloy ring with screw thread, which engages the screw threads in the breech opening of the gun. The rear plate is arranged to fit the carrier, and is provided with bevel teeth corresponding with those on the breech mechanism lever. The interior of the breech screw is recessed for the reception of the service striker with firing pin removed and dummy firing pin substituted. The interior of the front plate is fitted with an indiarubber pad to take the blow of the dummy firing pin when the trigger is pulled; this pad, when worn out, will not be replaced.

Dummy breech screws of latest manufacture have the outer face of the front bronze plate made similar in shape to the front end of the service breech screw, but slightly larger in diameter, so as to work the extractor in the gun. Such dummy breech screws are described as Mark II. Existing screws altered to conform to the Mark II pattern are known as Mark I*.

In the case of Q.F. 18-pr. guns using Mark I dummy breech screws, if the drill cartridge case is not used for loading on account of grit, etc. getting on the breech screw, the extractor should be removed from the gun.

Instructions for Removing and Replacing Breech Fittings.

To Remove the Breech Fittings.

Before commencing to remove the fittings, the breech screw and carrier should be swung into the loading position.

Breech Mechanism Lever, Guide Block, Firing Lever, Striker and Firing Pin.

Remove the keep pin of the breech mechanism lever hinge bolt, and withdraw the hinge bolt, when the breech mechanism lever, guide block with firing lever, and striker can be removed. Slide the firing pin out of the striker.

Breech Screw and Retaining Catch.

Press in the catch retaining breech screw clear of the recess in the screw and unscrew the latter (to the right) from the carrier. Withdraw the retaining catch with spiral spring.

Firing Hole Bushes, Marks I and II.

(This will only be carried out by an Armament Artificer.)

Unscrew the bush from the interior of the breech screw by means of the special wrench. In the case of Mark II bushes, care must be taken to first remove the fixing screw for the bush in the breech screw.

Carrier.

Remove the keep pin of the carrier hinge bolt, and withdraw the hinge bolt and carrier.

Extractor.

Remove the keep pin of the extractor hinge bolt, and withdraw the hinge bolt and extractor.

Trigger.

Remove the keep pin and withdraw "Part I" trigger with bush, collar, and spring from the left side, and "Part II" trigger to the rear.

Striker and Guide Block.

When removing the striker from, or inserting it into, the guide block, the safety catch in the latter must always be in the firing position.

Striker, Main Spring, &c.

Press on the top of the spring guide so as to slightly compress the main spring, and at the same time tilt the upper end of the guide from the striker, and withdraw the guide and main spring. Slide the firing pin out of the groove in the front end of the striker. Remove the pin securing rebound block, and withdraw the latter.

Safety Catch, Guide Block.

Place the safety catch in the firing position, and force it out of its recess in the guide block towards the centre of the block, and withdraw it.

TO REPLACE THE BREECH FITTINGS.

The fittings are replaced in the reverse order.

When inserting the breech screw in the carrier, care must be taken, before commencing to screw in, to hold the breech screw "square" against the face of the carrier with one of the threaded portions of the screw uppermost, the stamping on the screw being to the rear. Two and one quarter turns of the breech screw are required in screwing in, the retaining catch being pressed in clear of the recess in the screw during this operation.

When inserting the trigger, first correctly assemble the spring with the projecting ends in the holes for their reception in the "Part I" trigger and bush, then insert the collar on the trigger with the recessed portion innermost, and twist the bush on the trigger until the projection on it engages with the recess in the collar. Insert "Part I" trigger with bush, collar, and spring into the left side of the gun, and engage with "Part II" trigger inserted from the rear. Insert keep pin.

SEPARATE DEMANDABLE STORES.

DRIFT, No. 12.

The drift is of steel and is for use in removing keep pins from the mechanism.

Gauge, Striker Protrusion, No. 1.

The gauge is of steel plate, and is for use in gauging the protrusion of firing pins or needles of strikers of Q.F. 6-in. to 12-pr. guns.

Instructions for Use of Gauge.

See "Regulations for Magazines and Care of War Matériel."

Rimer, Breech Screw, Q.F. 13 and 18 pr.

The rimer is of steel, and consists of a cutter with holder, sleeve and guide block. It is for use in removing burrs from the striker recess in the breech screw.

Instructions for Use of Rimer.

See "Regulations for Magazines and Care of War Matériel."

Wrench, Breech Mechanism, No. 77.

The wrench is of steel, and is for use in removing or inserting the firing hole bush in the breech screw.

Side Arms, &c.

Cleaner, piasaba, No. 7.—The cleaner consists of a piasaba brush fixed on the middle portion of a lanyard. A lead ball is attached by white line to one end of the lanyard so as to carry it through the bore of the gun.

Cleaner, wool, No. 1.—The wool cleaner is generally similar to the piasaba cleaner described above, from which it differs principally in having a wool sponge fixed in the middle portion of the lanyard instead of a brush.

Cover, breech.—The cover is made of waterproof canvas and formed to protect the breech mechanism of the gun, and the rocking bar sight; it is secured in position by lacing loops and quick release straps.

Cover, muzzle.—The cover is made of khaki-coloured waterproof canvas shaped to suit the muzzle of the gun; it is provided with a leather strap to secure it in position.

Lanyard, firing, No. 15.—The firing lanyard is made of tarred white line with steel hook on one end shaped to suit the trigger of Q.F. 18 and 13 pr. guns. A wood toggle is attached to the other end of the lanyard (*see* Plate IV).

CARE AND PRESERVATION OF GUN AND FITTINGS.

See also "Regulations for Magazines and Care of War Matériel."

The breech fittings, and also the guides on the jacket by means of which the gun slides in the cradle of the carriage, should be kept clean and oiled or greased, and maintained in good working order; all working surfaces must be well lubricated, the fittings being taken off sometimes for this purpose, especially after firing.

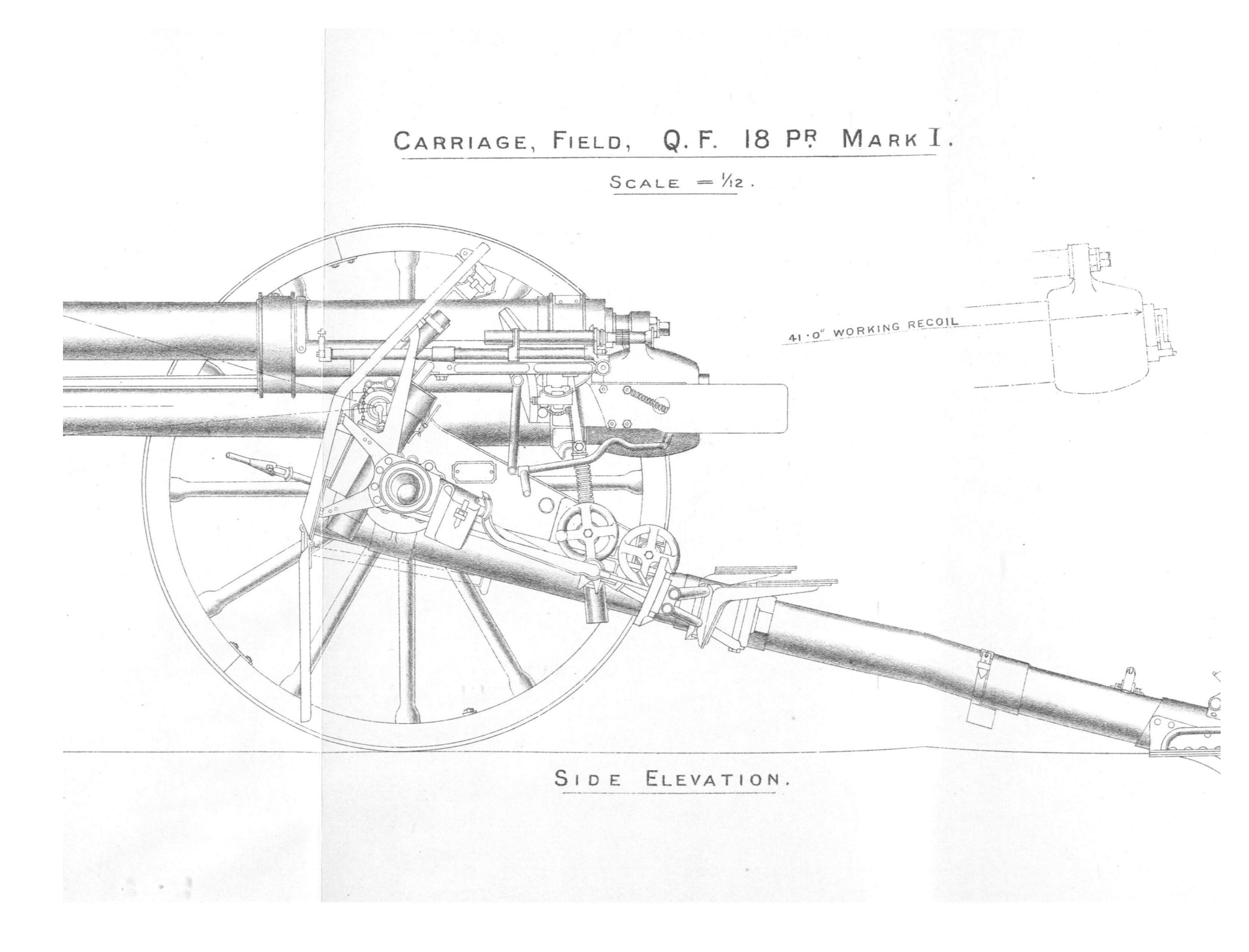
Lubricating holes are prepared in the upper side of the carrier to admit of the rear end of the breech screw in the carrier being oiled.

LANYARD, FIRING, No. 15 MARK I.

SCALE = 1/2.

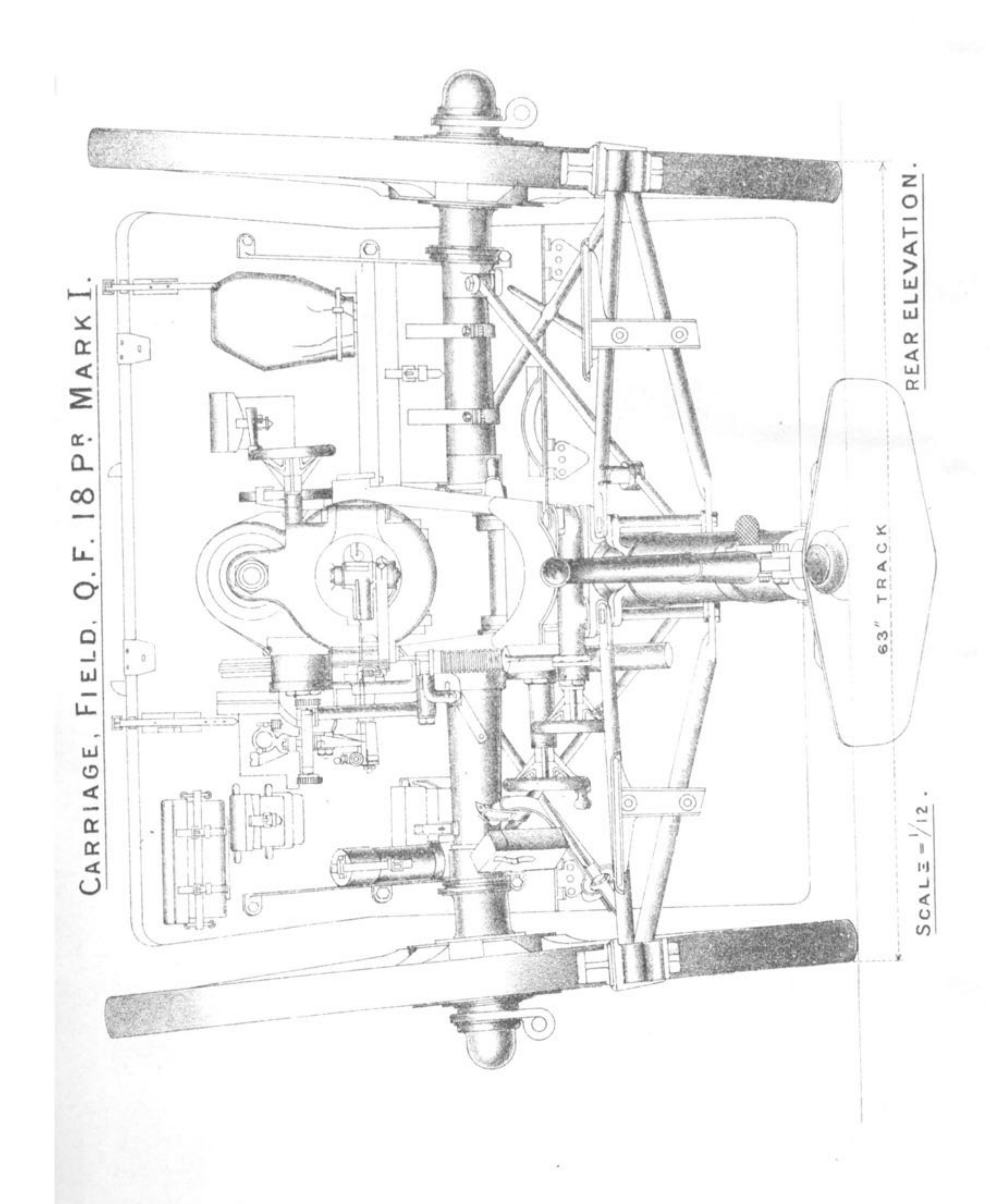
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Malby & Sons, Lith


Carriage, Field, Q.F. 18 Pr. Mark I.
Scale = 1/12.
41·0" Working Recoil
Side Elevation.

To face page 11.

Plate VI.



3256.

Malby & Sons, Lith.

The holes are closed against the ingress of dust by means of a brass plunger and spiral spring which must be pressed down by the spout of the oil can when lubricating.

The breech should be kept covered up, when possible, to prevent dust and grit from getting into the interstices of the breech fittings, which might impede their easy working. A waterproof canvas cover is provided for the purpose.

A gauge, testing clinometer plane and axis of bore is provided for use of Inspecting Officers.

For description and use of gauge, *see* "Regulations for Army Ordnance Services, Part II."

A "gauge, plug, bore, low limit," for provisional condemnation is provided for use of Inspecting Officers, to save time and to avoid unnecessary measurements.

The gauge consists of a cast-iron cylinder having a handle formed at one end to facilitate insertion into the bore. A hole is made through the handle for the attachment of a line for pulling the gauge through the bore.

CARRIAGE, LIMBERS, WAGONS, &c.

Carriage, field, Q.F., 18-pr., Mark I.

(*Plates V and VI.*)

The carriage is constructed to allow of 16 degrees elevation and 5 degrees depression being given to the gun, which recoils axially in a cradle, the latter being fitted with a hydraulic buffer to limit the recoil to about 41 inches and running out springs to return the gun to the firing position. The carriage is also constructed so that the elevation of the gun can be altered without interfering with the line of sight. It is provided with a seat on each side of the trail for two of the gun detachment, and with a shield for the protection of the numbers serving the gun.

The carriage is fitted to carry various stores, *see* list of stores, p. 39, and packing diagram, p. 45.

The principal parts of the carriage are:—

- Trail.
- Carriage body.
- Cradle.
- Hydraulic buffer.
- Running out springs.
- Elevating gear.
- Range gear.
- Traversing gear.
- Firing gear.
- Brake gear.
- Shield.
- Axletree and wheels.
- Sights.

TRAIL.

The trail is tubular, and is secured to the underside of the axletree by a bracket, which also forms a pivot for the carriage body. The rear end is fitted with a spade, lifting handles, trail eye, and a traversing lever, which latter can be folded down and held by a spring clip when not in use. The trail is further supported by a tensile stay on each side, one end of which is attached to the axletree by a bracket.

Carriage Body.

The body, which is attached to the trail, consists principally of two triangular-shaped frames connected by transoms, and provided with bearings, through which the axletree passes and by which it is pivoted for traversing.

Cradle.

The cradle is of bronze, with steel trunnions to pivot it to the carriage body, the left trunnion being prolonged and threaded for the reception of a stud for supporting the rocking bar sight; it has an opening in the lower portion for the gun and in the upper portion for the spring case. Longitudinal recesses are cut in the inner surface of the lower portion for the reception of the guides on the jacket of the gun. A steel guard is fitted to the left side to protect the gun layer, and a notch and point are formed above the spring case for rough laying.

Clamping Gear.

(*Plates VIII and X.*)

The gear is provided to clamp the cradle to the carriage body in the travelling position. A spindle with clutches and handle is fixed to the carriage body, so that when the rear of the cradle is depressed to its full extent, in elevating the gun, the clutches may be made to engage with semicircular shaped lugs formed on the underside of the cradle, and rigidly fix the cradle to the carriage. A stop is fitted to the carriage body to limit the travel of the handle of the clutch spindle in the clamped position. This gear also determines the point of maximum elevation. In the event of the clamping gear becoming jammed and difficult to release, it can be overcome by easing the *lower* elevating-wheel by hand before unclamping.

Hydraulic Buffer and Running Out Springs.

(*Plate VII.*)

The hydraulic buffer, which is contained in the spring case in the upper portion of the cradle, consists of a cylinder, piston, piston rod, controlling plunger, and stuffing box with gland. The cylinder is closed at the rear by the controlling plunger and at the front by the stuffing box and gland, which are locked in the required position by a spring stud. The gun is attached to the cylinder and secured by two nuts. A number of longitudinal grooves of varying depth are formed on the inner surface of the cylinder, so that the space for the flow of the liquid between the piston and the cylinder varies during recoil; by this means an approximately constant pressure is maintained in the buffer throughout the stroke. The front end of the piston rod is fixed to the front of the spring case. The rear end is bored for the reception of the controlling plunger, which, by displacing the liquid inside the piston rod, brings the gun gently to rest when returning to the firing position.

A filling hole, closed by a plug with chain, is provided at the rear end of the cylinder.

[F]ace page 12.

CARRIAGE, FIELD, Q.F. 18 PR. MARK I.

SECTIONAL ELEVATION OF HYDRAULIC BUFFER AND SPRING CASE.

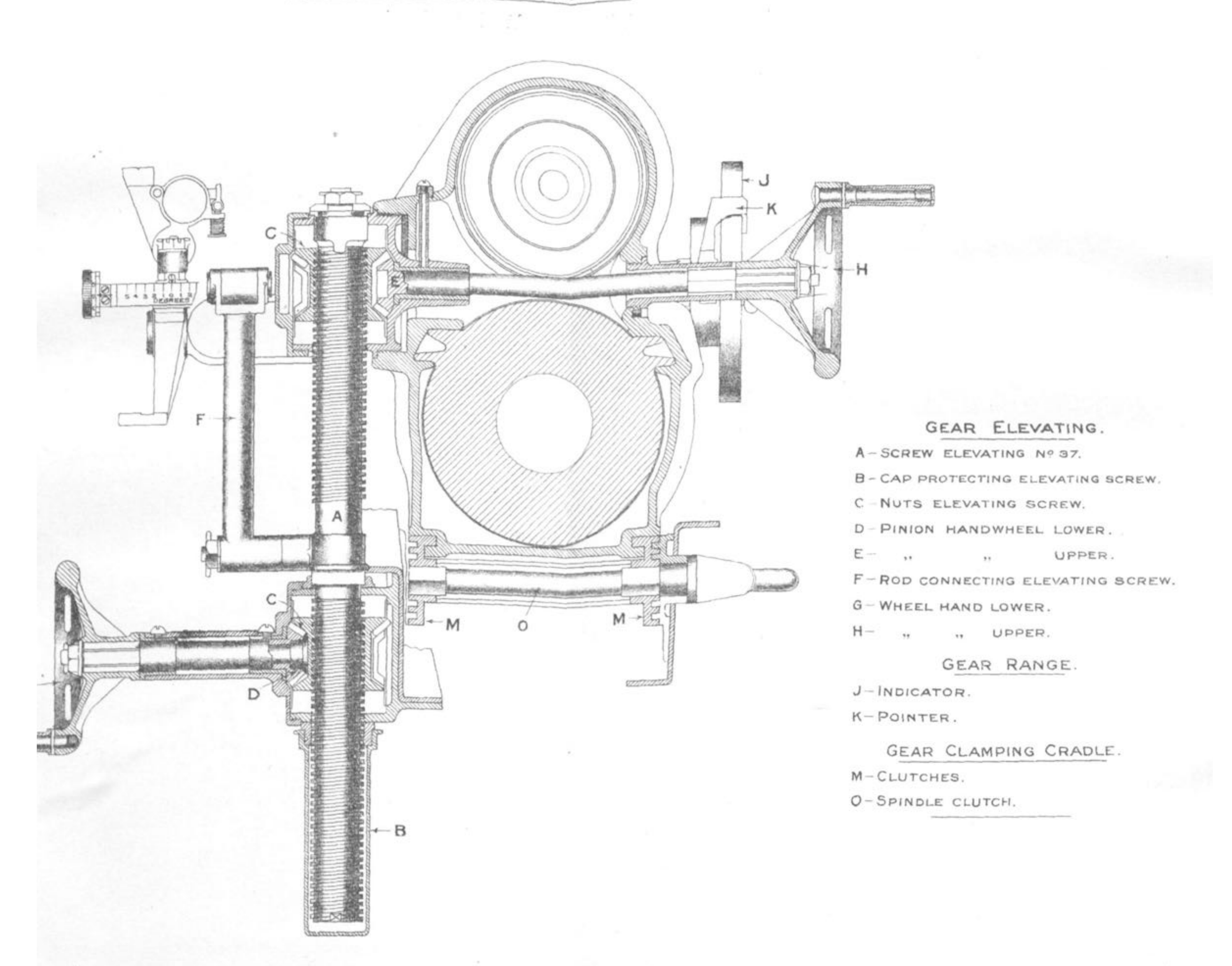
SCALE = 1/4.

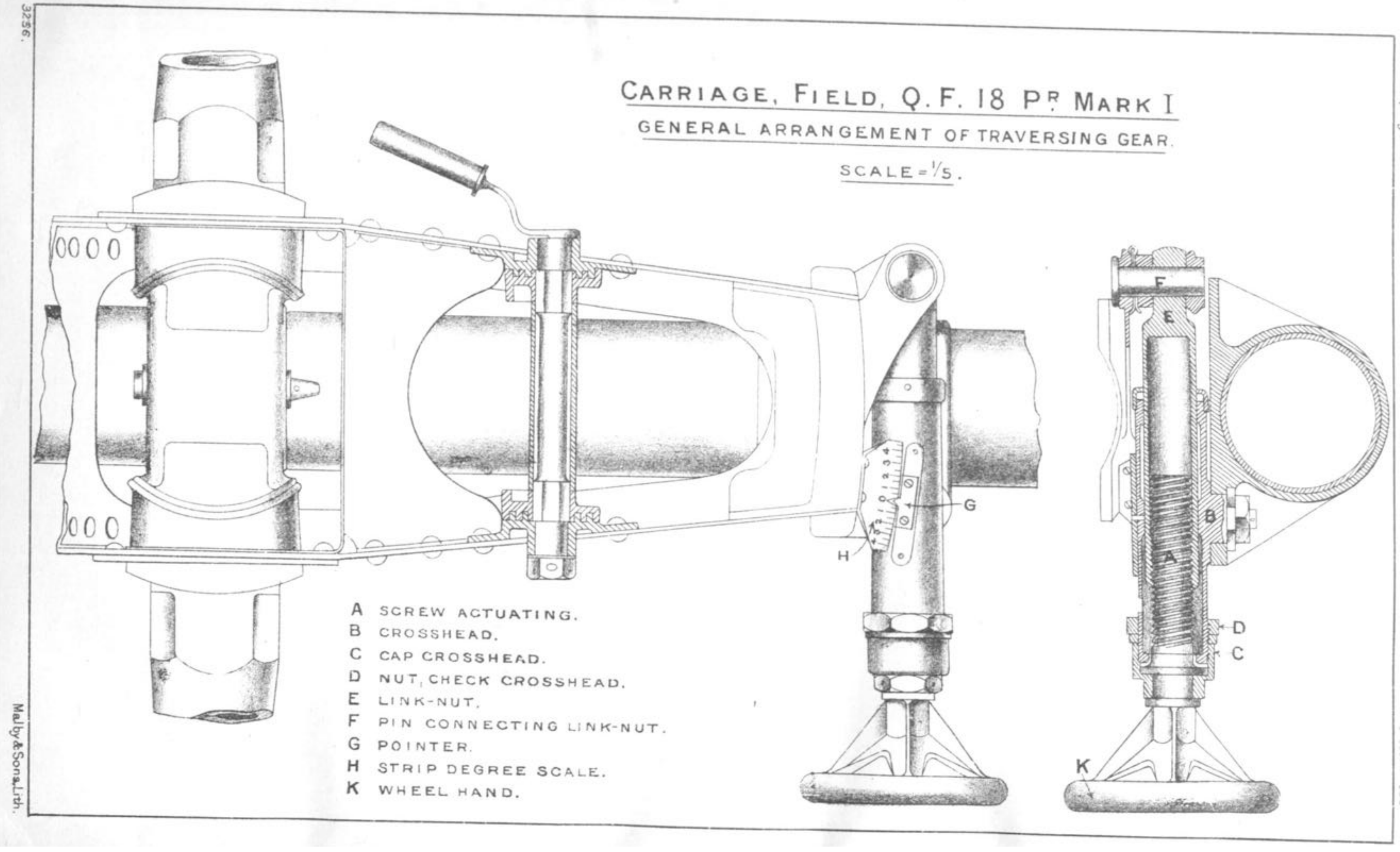
CARRIAGE, FIELD, Q.F. 18 PR., MARK I.

GENERAL ARRANGEMENT OF ELEVATING, CLAMPING AND RANGE GEAR.

SCALE = 1/5.

CROSS SECTIONAL ELEVATION.





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The running out springs surround the hydraulic buffer cylinder and are enclosed in a steel case which is screwed into the cradle above the gun. They consist of two sets, inner and outer, which are held under initial compression; each set is divided into four sections, separated by parting plates; the inner and outer sets are also separated longitudinally by an inner case.

For the better detection of a leak in the gland, holes are bored in the spring cases; four holes near the rear end of the inner spring case, and two holes underneath, one at the front and one at the rear of the outer spring case.

The buffer contains about 4½ pints of mineral oil.

Action.—When the gun recoils on firing it draws the buffer cylinder with it to the rear; the liquid in the cylinder in passing from front of piston to its opposite side is forced through the grooves in the cylinder, which, owing to their shape, gradually diminish the space for the flow of the liquid and brings the gun to rest. Meanwhile the running out springs have been further compressed; their subsequent expansion causes the gun to return to the firing position, and in doing so the controlling plunger displaces the liquid in the rear end of the piston rod, which results in the gun being gently brought to rest in the firing position.

Elevating and Range Gear.

(*Plate VIII.*)

The gears are so arranged that the elevation of the gun can be altered without altering the line of sight. The hand wheel on the left of the carriage is for aligning the sight on the target (the range indicator remaining stationary), while the hand wheel on the right side is actuated until the required range is indicated on the yard scale ring (the sight remaining stationary).

The range indicator is fitted to the right side close to the hand wheel, and consists of a yard and degree scale ring graduated on its face in hundreds of yards to 6,200 yards, with readings by means of a pointer for every 50 yards; the periphery of the ring is graduated up to 16 degrees, with readings for every 10 minutes.

A bracket for No. 7 dial sight, with carrier and deflection scale, is secured by screws to the arc of the range gear. A clamping arrangement is provided for securing the carrier to the bracket.

On coming into action (gun being in the housed position) release the clamping handle, place the traversing pointer at 0 degrees, and bring the gun to about the horizontal position by means of the left elevating hand-wheel. Either gear, elevating or range, can then be worked as required.

Traversing Gear.

(*Plate IX.*)

The traversing gear consists principally of a crosshead, link nut, and an actuating screw with a hand wheel. The crosshead is pivoted vertically to the traversing bracket in which the rear end of

the carriage body slides. The working parts are protected from the ingress of dust, &c., by cotton packing packed round the outside of the link nut. The nut is linked to the carriage body, and by means of the hand wheel on the end of the screw, four degrees of traverse right or left can be obtained. A scale strip and pointer indicate the angle of traverse. The scale strip has black graduations on brass on the left, and white graduations on a black ground on the right side of zero. A strap, attached to the left tensile stay, is used to prevent the hand wheel from turning when travelling.

Firing Gear.

The firing gear is arranged so that the layer can fire the gun without altering his position when laying. It is attached to the left side of the cradle, and consists principally of a connecting rod, connecting arm, and a spring lever, which engages with the trigger of the gun. The connecting arm is pivoted to a fulcrum on the cradle at one end; the other end is connected to a spring lever by the connecting rod, which is provided with a handle for operating the gear. After firing, the handle is returned to the forward position by a spring attached to the lever and the guard protecting gun layer.

The gun can be fired when within 2 inches from the "run up" position.

Brake Gear.

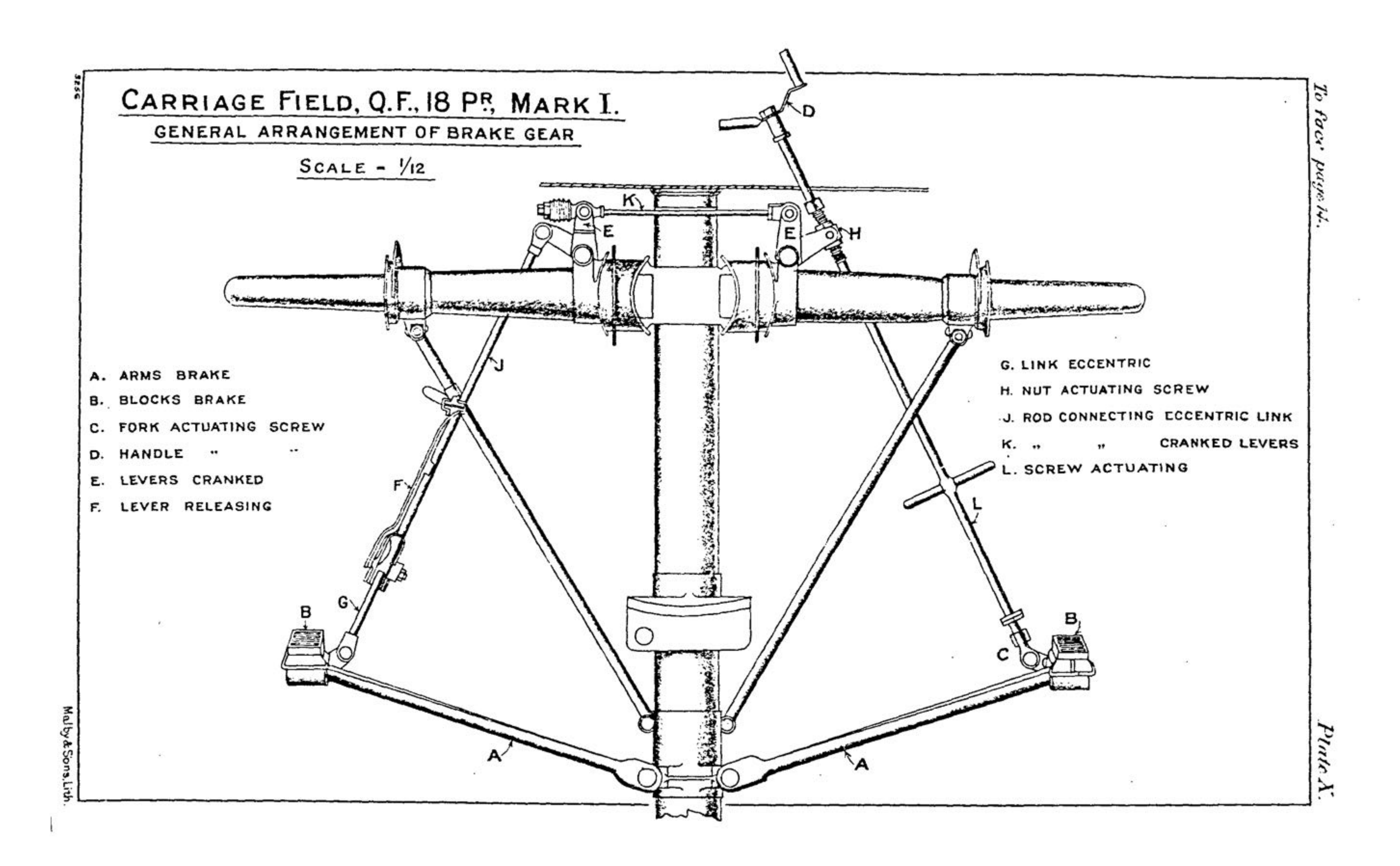
(*Plate X.*)

The tire brake can be used when travelling, or as a recoil brake. It consists principally of two brake arms, two cranked levers, connecting rods, and an actuating screw. The brake arms are pivoted at one end to a bracket on the trail, and provided at the other end with the service cast-iron brake block, which acts on the wheels. Each of the cranked levers is pivoted to brackets on the axletree, one on each side of the carriage body; one arm of each lever is connected in front of the axletree by a connecting rod; the outer arm of the right hand lever is provided with a nut, through which the front end of the actuating screw passes, the other end being linked to the right brake arm. The outer arm of the left hand lever is connected to the left hand brake arm by a rod and eccentric link; a releasing lever, with an eccentric pivoted to the connecting rod and link, enables the brake to be quickly released when required. When travelling, the lever is secured by a quick release strap, and the connecting rod by a leather tie passed round it and the left tensile stay at the point of crossing.

The brake arms are actuated by the handle at the end, or by the cross handle near the centre of the actuating screw.

Shield.

The shield is of steel, strengthened by wooden slats. It is in two parts, upper and lower. The upper portion is attached to the axletree by supporting brackets, and to the trail by a flange with bolts. The lower portion is hinged to the upper, and hangs vertically



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when in action; for travelling, it is secured to the trail by a pawl, with a releasing lever and locking pin. Two straight edges on the top of the shield indicate the approximate field covered by the traversing gear, as seen by the number standing at the traversing lever.

Leather cases and fittings are provided for carrying on the shield and axletree a dial sight, field clinometer, sight clinometer, spare parts, fuze keys, shovel, aiming posts, breech and muzzle covers, oil can, fuze indicator, tool case and telescope. An advance loop is fitted to the centre of the shield.

The lifting jack will be applied from the front of the carriage under the outer hinges of the shield.

Axletree and Wheels.

The axletree (2nd class, "C," No. 206) is a tubular steel forging; it is connected to the trail by three brackets, the outer brackets being recessed on the outer faces for the reception of an L-shaped leather ring, which is secured by a steel plate. The L-leather envelops the inner end of pipe box, and prevents the ingress of dirt, dust, &c. The outer end of each arm is fitted for a linch pin and an adjusting collar, which has a number of recesses (through which the linch pin passes) cut in one face; the recesses are of varying depths, from ·2 inch to ·5 inch, increasing by ·05 inch, so that any reduction in the length of the pipe box, due to wear, may be adjusted.

The wheels are 2nd class, "C," No. 45, 4 ft. 8 in. diameter, with steel nave, removable pipe box, and a 3-inch steel tire with rounded edges. The nave consists of two flanges of corrugated steel, which are connected by bolts. The inner flange is fitted with a steel ring to strengthen it, and the outer flange with a centring ring. The pipe box passes through the centre of the flanges, and is secured by a nut, which is prevented from working loose by a flat spring which is fixed to the pipe box and engages with one of a number of indents on the rim of the nut. A dust cap is screwed on the outer end of the pipe box; it encloses the adjusting collar, linch pin, and the end of the axletree arm. The inner face of the cap is recessed for the reception of a corresponding projecting ring on the nut, the cap being secured to the nut by a split keep pin. The pipe box is provided with a lubricating hole, which is closed with a ½-inch screw.

The drag washer is free to revolve round the nut, and is secured by the dust cap.

On an emergency, a 2nd class, "C," No. 200 wheel may be used to replace a No. 45 wheel, in which case the adjusting collar and linch pin for capped wheels may be used, the linch pin being secured by a piece of wire or a leather lace. In place of the adjusting collar and linch pin, the ordinary 2nd class drag washer and linch pin can, if desired, be used.

When using No. 200 wheels which have not had the inner flange reduced in diameter, the dust excluder (leather with keep plate) must be first removed.

Sighting.

The carriage is fitted on the left side with a rocking bar sight with sight clinometer, and No. 4 sighting telescope. It is provided with a No. 1 dial sight or No. 7 dial sight and No. 2 carrier.

Rocking Bar Sight.

(*Plate XI.*)

The rocking bar sight consists principally of a rocking bar and a sight bar. The rocking bar is pivoted horizontally at the front end to an arm on the left trunnion of the cradle. A bracket is riveted to the underside at the rear end to carry a sight clinometer. An open square socket is formed in the bracket for the reception of a similar shaped projection on the arc bracket of the range gear, by which the reciprocating motion of the elevating screw is conveyed to the bar. The rear end is provided with a crosshead with a traversing screw with milled heads, and a nut which enables 5 degrees of deflection right or left to be given to the sight bar. Degrees of deflection are marked on a scale plate, and minutes in multiples of 5 on a ring fixed to each of the milled heads of the traversing screw.

The sight bar is pivoted vertically about the centre to a socket with an adjustable bush in the rocking bar. The rear end of the bar is fixed to the traversing nut. The nut on the deflection screw is in two parts having a spring inserted to keep the halves apart; the object of this arrangement is to take up backlash in the deflection gear due to the wear of the screw. Two holders with caps secured by spring clamps are fitted to the bar to carry a "Telescope, sighting, No. 4." The rear holder is fitted with a notched leaf hind sight, and the front end of the bar with an adjustable acorn-pointed fore sight. A cap is provided for the protection of the sight. The rocking bar sight is removable, being attached to the trunnion arm by a securing key with a chain.

The permanent angle of deflection for drift is given by the axis of the trunnion cradle being inclined at an angle of 1½ degree, the left trunnion being the lower, so that as elevation is given, the gun muzzle moves to the left the necessary amount to correct for drift.

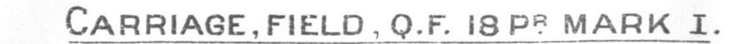
Sight Clinometer.

(*Plate XI.*)

The sight clinometer is used to give the "angle of sight," and admits of 20 degrees elevation or 20 degrees depression. It is constructed so that it may readily be attached to the rocking bar sight. It consists principally of a cradle with a worm spindle, and a toothed arc with a spirit level. The cradle is fitted on the underside with spring clips for fixing it to the rocking bar, and with radial grooves on the top, in which the arc slides; the worm spindle passes through the centre of the cradle, and is supported at each end by movable bearings, one of which is pivoted to the cradle, and the other free to slide in grooves for a limited distance, so that the worm on the spindle may be readily disengaged from the teeth in the arc when necessary for quick adjustment. The worm is kept up to its work by a flat spring with a bearing surface on its underside, and each end of the spindle is fitted with a micrometer collar marked to read minutes in multiples of 5. The arc consists of a toothed segment with a spirit level above; it slides in the grooves on the cradle, and the teeth engage with the worm on the spindle; an adjustable pointer is fitted below the level for reading the degrees of elevation and depression engraved on the cradle.

Carriage, Field, Q.F. 18 Pr. Mark I.

General arrangement of rocking bar sight with sight clinometer in position



A Bar rocking.
B " sight
C Clinometer sight
D Telescope sighting No. 4

Telescope Sighting, No. 4.

Particulars.

Magnification	5½ diameters.
Field of view	5½ degrees.
Length over all	17·25 inches.
Weight	2 lb. 12 oz.

Mark I.—The telescope is of the ordinary erecting type, with an object glass and terrestrial eyepiece.

The body is fitted with two gunmetal collars, which accurately fit the bearings on the sight bar; the rear collar has a small projecting pin, which prevents the telescope from turning in the bearings

The eyepiece is fitted with a metal eye guard, and a diaphragm carrying a needle-shaped pointer is fixed at the focal length of the object glass. The eyepiece also carries an engraved ring numbered 0 to 7, which in conjunction with an arrow on the body, registers the turning movement of the eyepiece, 4 being the position for normal vision, so that individual layers may set their focus to the figure previously determined.

The object glass is fixed in the correct position for infinite focus, or, in other words, for all objects over 400 yards distant. It is protected by a ray shade.

Two caps, connected by a sling, are provided to protect each end of the telescope; the sling is attached to the body of the telescope by a small strap with buckles.

Mark II.—Mark II differs from Mark I in the diaphragm which carries the pointer being made adjustable, so that collimation may be carried out by moving the diaphragm, instead of by rotating the object glass in eccentric rings.

Mark III.—Mark III is generally similar to the Mark II, except that the dimensions differ slightly. Several parts are made interchangeable.

To focus the Telescope.

The telescope is issued with the object glass fixed at its point of infinite focus, and is then suitable for all distances over 400 yards; it therefore only remains to focus the pointer with the eyepiece. To do this, place the telescope in its bearings, fasten down the clips and direct the telescope on a well-defined object, preferably about 1,000 yards or more distant.

Screw the eyepiece in or out until the pointer stands out clearly; the object will then stand out clearly at the same time.

Care of Telescope.

See "Regulations for Magazine and Care of War Matériel."

Dial Sight, No. 1, Marks I* and II.

The dial sight consists of a circular carrying plate with degree scale ring, a crosshead and pin, and a sight plate with pointer. The carrying plate is hinged at the centre to the crosshead, and the crosshead

is hinged transversely to the crosshead pin. This arrangement admits of an adjustment right and left to compensate for any difference that may occur in level of the wheels, and for elevation or depression being given to the plate and sight. The degree scale ring is fixed to the periphery of the carrying plate by screws; it is marked in degrees, 180 on each side of zero, the required angle being read by means of a pointer fixed to the rear end of the sight plate. Should it be found by examination that when the sight line and axis of the gun are parallel, 0 degrees is *not* indicated, the pointer is so formed as to admit of the required adjustment being made. The sight plate is pivoted to the centre of the carrying plate and jointed near its centre; the joint pin is provided with a thumb nut for clamping the plate in the extended or folded position; the plate is fitted with an acorn-pointed fore sight at the front end, and notched to form a hind sight at the rear end. A clamping screw is provided to fix the sight plate at the required angle. The sight is fixed to the bracket by the crosshead pin, which fits into a corresponding socket, and is secured by a keep pin.

Sight, Dial, No. 7 and Carrier, No. 7 Dial Sight, No. 2.

(*Plate XII.*)

The No. 7 dial sight is provided for indirect laying. Whilst the eyepiece is fixed, the top portion can be revolved in any direction and set to any angle that may be ordered. This angle will usually be that between the lines to the target and to an aiming point. The top of the sight is at a higher level than the layer's eye, so that an aiming point in any direction can be seen, and the layer can always lay the gun from his position behind the shield.

There is an arrangement at the top of the sight by means of which the line of sight through the top prism can be elevated or depressed. The necessary magnification is given by an object glass and eyepiece.

When using the sight whole degrees must be put on to the main scale and minutes on the micrometer head of the deflection or lower scale. After making use of the quick release for setting the main scale, the micrometer head must be turned through several degrees (to ensure that the worm and rack are properly engaged) before making the final adjustment.

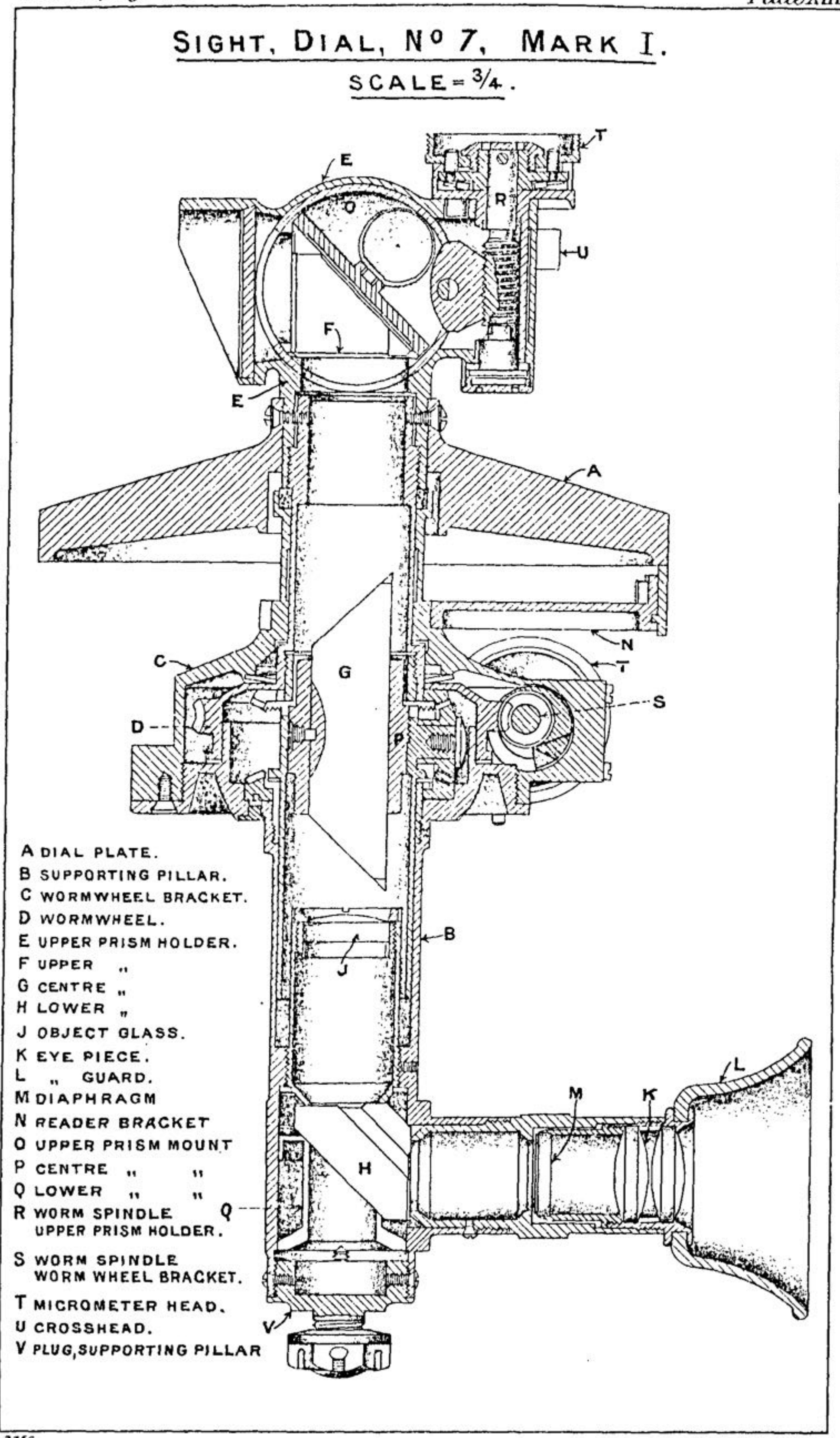
The No. 2 carrier consists of a steel bar which can be clamped into a fitting on the cradle. The upper portion is shaped to take the dial sight. It is also fitted with an arrangement for giving deflection up to 10 degrees right or left. This consists of an upper and lower bracket. The upper bracket is connected to the dial sight by means of four screws and a feather; fitted through it is a worm with a minute micrometer head at each end, readers for which are fitted on the bracket. Along one face is fixed the deflection degree scale. The lower bracket has worm teeth cut on it into which the worm gears. There is also a reader for the deflection degree scale attached to it. Right deflection is indicated by white graduations on a black background.

SIGHT, DIAL, No 7, MARK I.

SCALE = ½.

LOWER HIGHER

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SIGHT, DIAL, No 7, MARK I.
SCALE = 3/4.
A
B
C
D
E
F
G
H
J
K
L
M
N
P
Q
R
S
T
U
V
A DIAL PLATE.
B SUPPORTING PILLAR.
C WORMWHEEL BRACKET.
D WORMWHEEL.
E UPPER PRISM HOLDER.
F UPPER "
G CENTRE "
H LOWER "
J OBJECT GLASS.
K EYE PIECE.
L " GUARD.
M DIAPHRAGM
N READER BRACKET
O UPPER PRISM MOUNT
P CENTRE " "
Q LOWER " "
R WORM SPINDLE UPPER PRISM HOLDER.
S WORM SPINDLE WORM WHEEL BRACKET.
T MICROMETER HEAD.
U CROSSHEAD.
V PLUG, SUPPORTING PILLAR

Sight, Dial, No. 7.

(Plate XIII.)

Mark I.—The principal particulars of the sight are as follows :—

Magnification ... ... 4 diameters.
Field of View ... ... 10 degrees.
Horizontal rotation of reflecting prism... ... ... 360 degrees.

The optical combination is of an erecting type, comprising an object glass and eyepiece with erecting and reflecting prisms.

The dial sight consists principally of supporting pillar, upper, centre and lower prisms, worm wheel bracket, worm wheel, dial plate, and upper prism holder.

The supporting pillar is tubular, L-shaped, and is arranged to fit the No. 2 carrier on the carriage. The horizontal portion of the pillar is furnished with an eyepiece and a glass diaphragm having cross lines. A window is provided to admit light to the cross lines, and a dermatine eyeguard to keep out the extraneous light from the gun layer's eye and to protect him when firing. The upper end of the pillar is prepared with a flange for the reception of the worm wheel and worm wheel bracket.

A steel plug is screwed into the lower end of the supporting pillar, and is provided with a stud with nut and keep pin, the spring washer in the No. 2 carrier pressing against the top of the nut.

In order to keep the image always erect, the centre prism is made to revolve at half the speed of the top prism. This is effected by internal bevel gearing.

To the top of the pillar is attached a worm wheel bracket. A worm spindle in this bracket engages with the worm wheel. At either end of this worm spindle is a drum graduated in divisions of ten minutes; each revolution of the drum represents five degrees. The drum on the right is marked in white figures on black; that on the left in black figures on brass. By moving these drums, minutes of angle can be added to the degrees shown on the scale of the dial plate. The worm spindle is mounted on an eccentric bearing fitted with an actuating collar and thumb piece. When the thumb piece is moved upwards the worm is disengaged from the worm wheel, and the dial plate can be swung round. Fitted above the worm wheel bracket is a reader for the dial plate.

Attached to the worm wheel are the dial plate and a holder for the upper prism. The dial plate is graduated to read from 0 to 180 degrees "Right" and "Left." The markings for "Right" are white on a black ground; those for "Left" black on a brass ground. The upper prism holder is fitted with a window and rainshade. A crosshead with notch and foresight for rough laying is pivoted to the holder. The prism and crosshead admit of vertical adjustment to 15 degrees elevation and depression by means of a worm spindle with a micrometer head. The micrometer head has a graduated drum engraved in divisions of 10 minutes. Each revolution of the worm spindle indicates 5 degrees elevation or depression on the crosshead. Underneath the crosshead is a scale showing graduations of 5 degrees; this scale is read by means of an arrow on the holder. Indicating arrows and the words "Higher" and "Lower" on the worm spindle

bearing, denote the direction in which the micrometer head should be turned for raising or depressing the line of sight, and act as a reader.

Mark II.—Dial sights differ from Mark I, described above, in the following particulars:—

The vertical scale graduations on the upper prism holder crosshead and micrometer head, except the zero and index marks, are omitted.

The worm wheel and worm spindle bearings are of manganese bronze or other non-corrodible metal instead of steel.

All springs and spring washers are nickel-plated.

A waterproof cover and holder to hold the No. 7 dial sight and No. 2 carrier is provided for carriage on the inside of the shield.

CARE AND PRESERVATION OF "SIGHT, DIAL, NO. 7" AND "CARRIER NO. 7 DIAL SIGHT, NO. 2."

The dial sight when issued from Woolwich is in correct adjustment, watertight, and with all the cells and joints secured with fixing screws.

It is very unlikely that the interior will be required to be cleaned, and the dial sight must on no account be taken to pieces.

The body of the dial sight must be cleaned with a clean soft cloth and a little oil, which must be rubbed off afterwards, care being taken that the glass is not touched.

The exterior of eyelens and window should be cleaned with chamois leather, specially kept for the purpose, and only by a competent person. Great care must be taken that no oil or grease is allowed to touch the glasses. Fingers when apparently clean and dry may leave marks on the lens which will impair the definition of the telescope.

Owing to the construction of the carrier the deflection arrangements should be occasionally tested for backlash by laying on a well-defined object and traversing the sight from right and left alternately by means of the deflection screw until the vertical crossline is aligned. If the deflection scale does not read the same in both instances, the difference of reading indicates the backlash.

Backlash may be due to the small coned portion of the carrier which is removed when inserting the sight in its carrier having become strained or not fitting properly.

To correct this, the removable portion of the coned surface of the carrier may perhaps be made to fit more perfectly by manipulating its fixing screws. If this fails, the coned surface of the removable portion should be slightly reduced with fine emery paper or a dead smooth file.

The No. 7 dial sight and No. 2 carrier will eventually supersede the No. 1 dial sight with Q.F. 18-pr. guns.

INSTRUCTIONS FOR TESTING AND ADJUSTING THE SIGHTS.

Any adjustments required to optical instruments must be carried out by an Armament Artificer.

TELESCOPE.

Mark I Telescope.—There is no internal adjustment provided for the Mark I telescope (except during manufacture); it is therefore less likely to get out of adjustment, and there are no small internal

TARGET FOR TESTING SIGHTING GEAR.

SCALE = 1/3.

14·0"

8·5"

12·38"

8·25"

7·15"

S

T

D

B

BASE LINE

B. BORE OF GUN.
S. ROCKING BAR SIGHTS.
T. TELESCOPE.
D. No 7 DIAL SIGHT.

4286

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screws to be manipulated. To obviate any small error left in the telescope during manufacture, the rear collar is provided with a pin to prevent the telescope being turned round in its bearings, and the small error is taken up by adjusting the fore sight.

Marks II and III Telescope.

Collimation.

Test.—Place the telescope in its bearings. Lay the pointer on some well-defined object. Release the hinged caps. Remove telescope and replace it, but with its pin uppermost. The tip of the pointer should remain on exactly the same point.

Adjustment.—If, when the telescope has been turned, the tip of the pointer appears to have moved *above* the point layed on, unscrew the capstan-headed screw beneath the telescope (having previously unscrewed the metal cap covering the capstan-headed screws) and screw up the one above the telescope until the pointer is brought half-way towards the point layed on, then by depressing the sight, move the pointer exactly on to the point layed on. Repeat the process until the pointer moves neither above nor below the point layed on.

If the pointer appears to have moved *below* the point layed on, reverse the above procedure.

Should the pointer move to either side of the object when the telescope is reversed it may be corrected in a similar manner.

See that all the capstan-headed screws are home, and replace the metal protecting cap.

Alignment Tests.

Before any of the following operations are carried out, the carriage should be placed on a firm platform, or on hard level ground, and manipulated until the gun is level transversely. If these arrangements cannot be conveniently made, the base line of the target (*Plate XIV*), if used, must be set parallel to the slope of the wheels.

(1) *To ascertain if the line of sight of the open sights is parallel to the axis of the telescope.*

Select a clearly defined object, at least one mile away, to lay on. The telescope and open sights should agree. If not, correct as detailed below.

If a clearly defined object is not available, construct a target with three circles on it—B, T, and S (*See Plate XIV*)—each circle divided into black and white sectors, the centres of the circles being the points to lay on. Set the targets up at a distance of about 50 yards from the gun. Lay the telescope by means of the elevating and traversing handwheels on the left side of the trail on the point "T." The open sights should now be on point "S." If not, correct as follows:—

Loosen the fixing screw below the fore sight with the spanner provided for the purpose and screw the acorn of the sight up or down until the line of sight is on "S." Then tighten up the fixing screw. There is no adjustment for transverse error, and should any error exist the telescope should be taken as correct. This error is not important, and is not likely to be large.

(2) *To ascertain whether vertical planes passing through the axis of the telescope and the axis of the gun are parallel to one another.*

Place the "Bush, testing sight, with cross wires" in the muzzle and remove the "Lever, breech mechanism." Set the sights at zero for elevation and deflection and lay through the bore on the distant point, or, alternatively, point "B." The telescope should now be aligned for direction on the distant point, or, alternatively, on the vertical line cutting the point "T." If not, correct as follows:—

Remove the keep pins and loosen the nut of the clamping pin, which passes through the pivot of the sight bar, and the nut below the pivot with the spanner provided for the purpose. Then, with the spanner, turn the adjusting bush in the pivot until the pointer of the telescope and the vertical axis of the crosswire in the gun are parallel. Tighten up the nut and clamping pin and replace the keep pins.

(3) *To ascertain whether the sight clinometer is in adjustment.*

Set the "Sight clinometer" at zero. Place the "Bar, testing sights," on the open sights. Set a clinometer at zero on the "Bar, testing sights," and bring the bubble central by turning the elevating handwheel on the left side of the gun. The bubble of the "Sight clinometer" should now be at the centre of its run. If not, adjust as follows:—

Turn the worm spindle of the "Sight, clinometer" until the bubble is central, then, with spanner No. 244, loosen the screws securing the indicator plate, and slide the plate until the indicator reads zero. Carefully tighten the securing screws, making sure that the indicator is not again moved. Next observe the zero point of the micrometer collar at each end of the worm spindle, and if any error is apparent, loosen the securing nuts with the spanner (No. 244), turn each micrometer collar till its zero is correct, and re-tighten the nuts.

(4) *To ascertain whether the range dial is in adjustment.*

Place a clinometer set at zero on the muzzle end of the guide ribs, and bring the bubble central by turning the elevating handweel on the right side of the gun. If the range dial does not read zero range, remove the split pin on the end of the dial spindle and slack back the nut about four turns by means of a McMahon spanner until the ring is free. Then make the zero of the ring coincide with the pointer, and screw up the nut by hand. Before tightening it up, see that the bubble is still central.

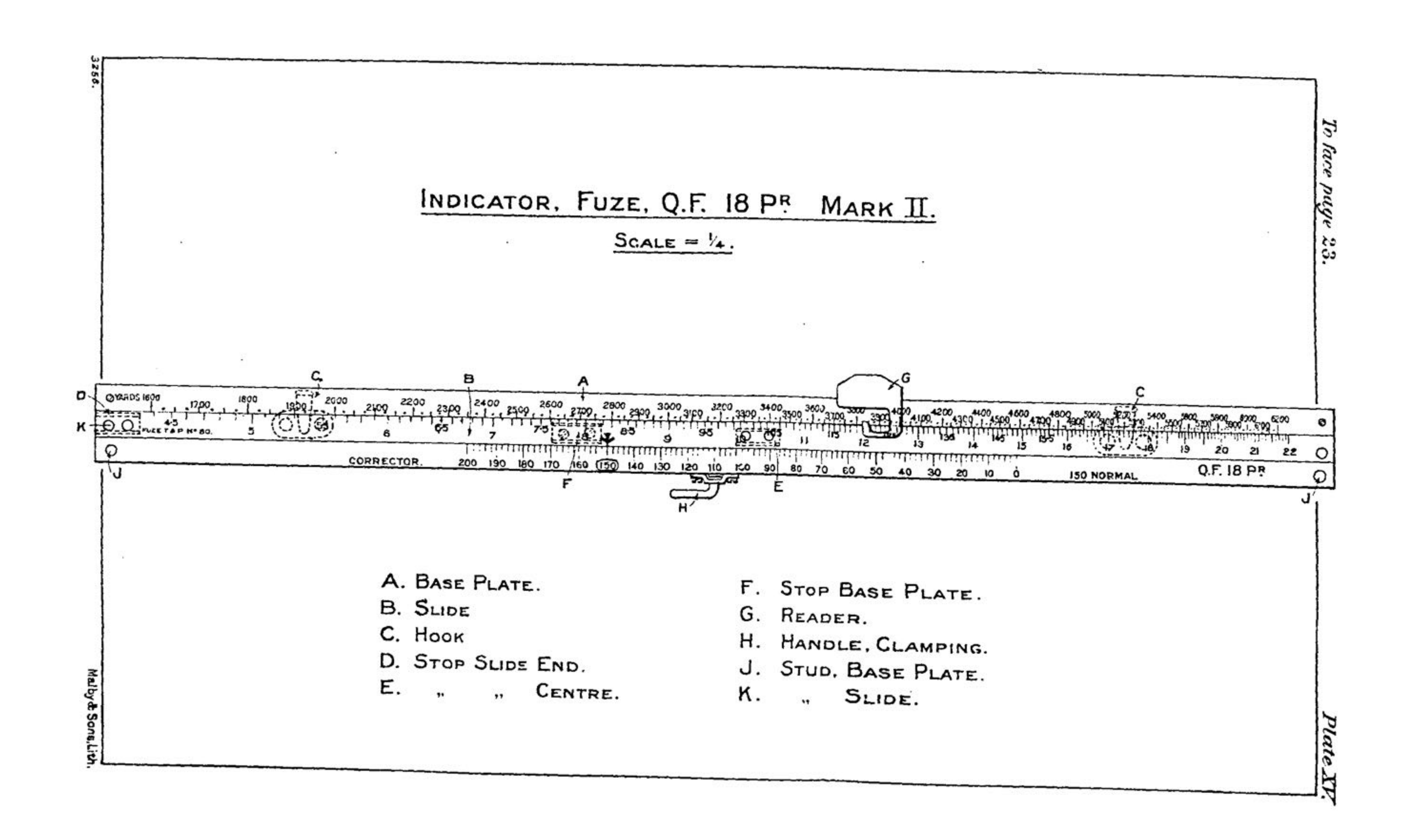
It is essential that the sight line should remain horizontal during this operation. Care should therefore be taken not to touch the handwheel on the left side of the gun, and a clinometer should be placed on the bar testing sight to finally check that it is still horizontal.

By placing the clinometer on the guide ribs of the gun at the muzzle end and adjusting the range dial to agree, the "droop" of the gun is allowed for.

Dial Sight No. 7 and No. 2 Carrier.

(a) *Direction.*

Test.—Lay the axis of the gun on the distant point, or point "B" of the target. Set the dial sight, deflection scale of the carrier, and


3256.
INDICATOR, FUZE, Q.F. 18 PR. MARK II.
SCALE = ¼.
A
B
C
D
E
F
G
H
J
K
CORRECTOR.
150 NORMAL.
Q.F. 18 PR.
A. BASE PLATE.
B. SLIDE
C. HOOK
D. STOP SLIDE END.
E. „ „ CENTRE.
F. STOP BASE PLATE.
G. READER.
H. HANDLE, CLAMPING.
J. STUD, BASE PLATE.
K. „ SLIDE.
Malby & Sons, Lith.
To face page 23.
Plate XV.

drum of the rocking bar sight at zero. Place the carrier with dial sight attached in its bracket on the elevating arc bracket and clamp at a convenient height. The vertical line in the dial sight should be on the distant point, or on a vertical line 8·5 ins. to the left of the point B on the target.

Adjustment.—If it is not, loosen the clamping nuts on the ends of worm spindle of the deflection scale of the carrier, turn the milled heads until the vertical line in the sight is laid on the correct point, and whilst preventing the milled heads from turning, revolve the adjustable drums with minute graduations until they read zero. Tighten up the clamping nuts. If the reader of the degree scale on the carrier is not at zero, loosen the two screws beneath it, and shift the reader plate to one side until it is so. Tighten up the two screws.

If sufficient adjustment cannot be given on the carrier, which allows of about $1\frac{1}{2}°$ to either side, the remainder must be put on the dial sight in a similar manner. The micrometer drums are similar, and the reader plate can be moved to either side when the two screws in it are slackened.

(*b*) *Elevation.*

Test.—Lay the telescope sight on the distant point. (It is not satisfactory to test the elevation on the target, as, owing to the carrier being adjustable for height, no definite point can be marked on the target for laying on.) Set the vertical scale at the top of the dial sight at zero. The horizontal line in the telescope should be on the distant point.

Adjustment.—If it is not, turn the micrometer head on the top of the sight until the horizontal line is on the distant point, loosen the clamping cap on the top of it, and whilst preventing the milled heads from turning, revolve the adjustable drum with minute graduations until it reads zero. Tighten up the clamping cap. The reader of the degree scale cannot be adjusted. If it is much out it should be re-engraved.

INDICATOR, FUZE, MARK II.

(*Plate XV.*)

The indicator consists of the following principal parts:—base plate, slide, slide clamp, reader and stop screws.

The base plate is of delta metal about $34\frac{1}{2}$ inches long, graduated on the upper portion with a yard scale, and on the lower with a corrector scale; it is grooved in the centre to receive the slide, which is graduated with a fuze scale.

The corrector scale is divided into divisions reading up to 200, 150 being the normal.

The slide can be clamped in any position desired by means of the clamp, which is attached to the base plate. The yard and fuze scales are read by the reader, which is free to move along the base plate, but it is prevented from coming off the base plate by stops. Attached to the reader is a small spring which can be manipulated by a screw for taking up any play in the reader due to wear.

Two indicators per sub-section will be carried, one on the shield of the carriage and one on an ammunition wagon at the rear.

LIMBER, Q.F. 18-PR., CARRIAGE, MARKS I AND II.

(Plates XVI and XVII.)

The Mark I limber consists of a steel frame, a limber hook, a second-class axletree, draught fittings, an ammunition box, and two field wheels.

The frame consists of four futchels, connected at the front end by a plate, and at the centre by stays. Platform and foot boards are fitted to the top, and draught hooks for the swingletrees to the front of the outer futchels. A steel limber hook, No. 31, is riveted to the rear end of the inner futchels.

The axletree, No. 208, is of weldless steel tube: it is fixed by flanges to the futchels. The linch pin and adjusting collar are similar to those for the carriage

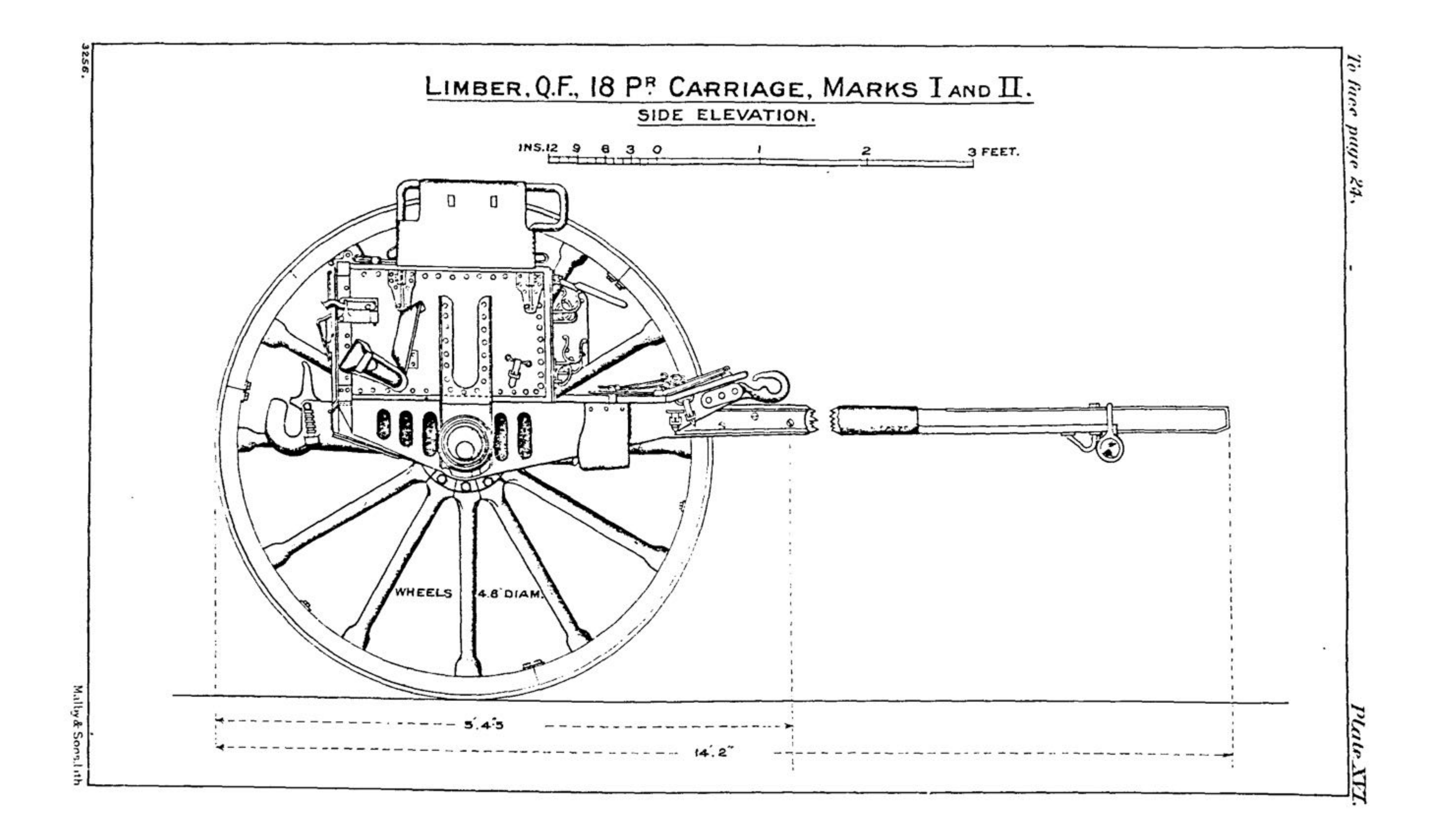
The fittings for draught consist of a No. 17 Mark III pole, a No. 3 supporting bar, and two No. 11 swingletrees. The pole and bar are for use with the R.A. pole draught breast harness. The pole is 12 feet 4½ inches in length over all; the front end is protected by steel wrapping plates; a U-shaped tug is passed through the pole from the underside and secured by a nut on the top. The tug forms a stop for the pole bar, and its position from the point of the pole may be varied from 14½ inches to 29½ inches, in distances of 3 inches, according to requirements. The pole bar is 3 feet 9½ inches in length, fitted at the centre with a circular loop, which is formed to pass over the front end of the pole and butt against the tug. Two links are fitted on each side of the loop, by means of which the bar is attached to the neck piece of the harness. The swingletrees are 2 feet 6 inches long.

The ammunition box is of steel, and opens at the rear; it is constructed to carry 24 rounds of "fixed" ammunition, is fitted with guard irons, Nos. 25 "near" and 26 "off," is secured to the frame by rivets, and supported by side connecting plates and gusset plates. Internally it is fitted with 24 tubular baskets secured by leather stops, or brass tubes fixed horizontally. A compartment is formed in the centre for two wood trays for small stores. The lid (the inside of which is covered with a leather pad to prevent the ingress of water) is hinged to the bottom of the box, and is provided with a shield plate of the same width, which hangs vertically below the lid when opened. The shield plate is hinged to the lid, and, when closed, the former is folded over the latter, which is secured by catches on each side of the box.

Spring clips are attached to the front of the box for carrying two rifles, in canvas covers, secured in position by means of "quick release" securing straps.

The limber is fitted on the underside with wire net receptacles for carrying canvas water buckets, with fittings to carry a 3-lb. grease tin, and two No. 3 lubricating cans (one for Rangoon and one for buffer oil); also various stores as shown in Packing Diagram A, page 45.

To face page 24.



LIMBER, Q.F., 18 Pr. CARRIAGE, MARKS I AND II.
SIDE ELEVATION.

Plate XVI.

3256.

To face page 24.

LIMBER, Q.F. 18 P^{R} CARRIAGE, MARKS I AND II.

REAR ELEVATION.

INS.12 9 6 3 0 1 2 3 FEET

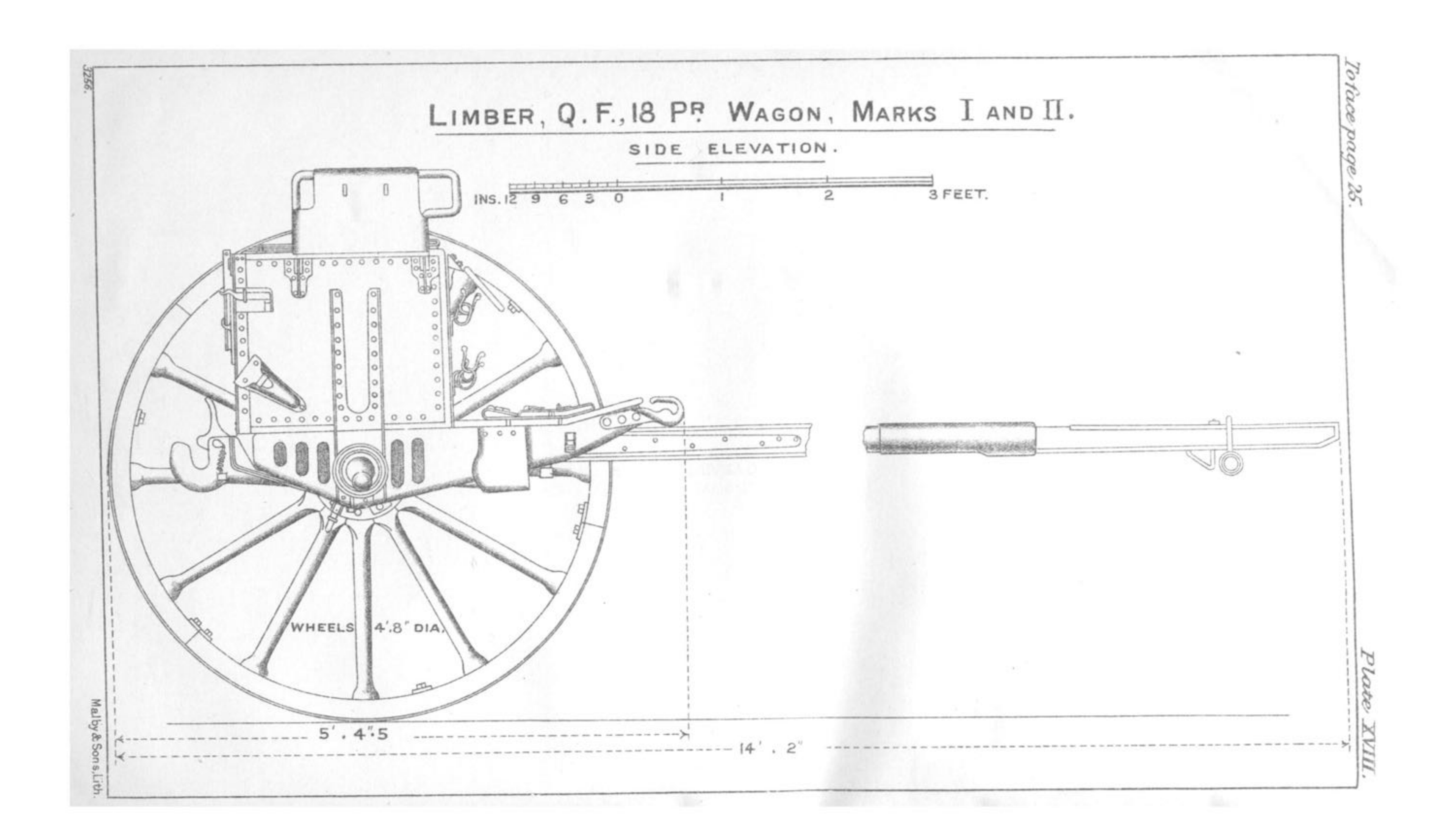
4'. 9"

5'. 3"

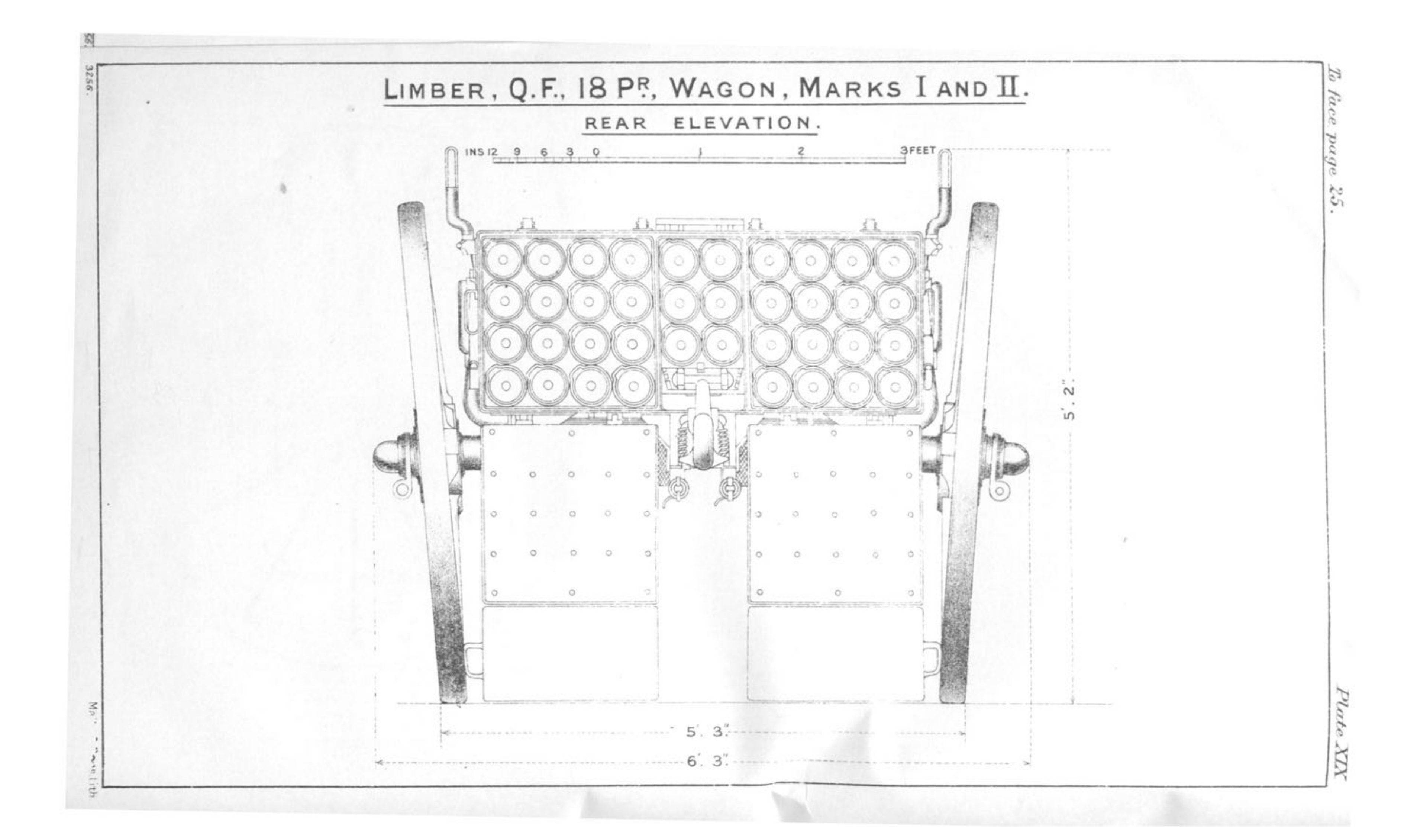
6'. 3"

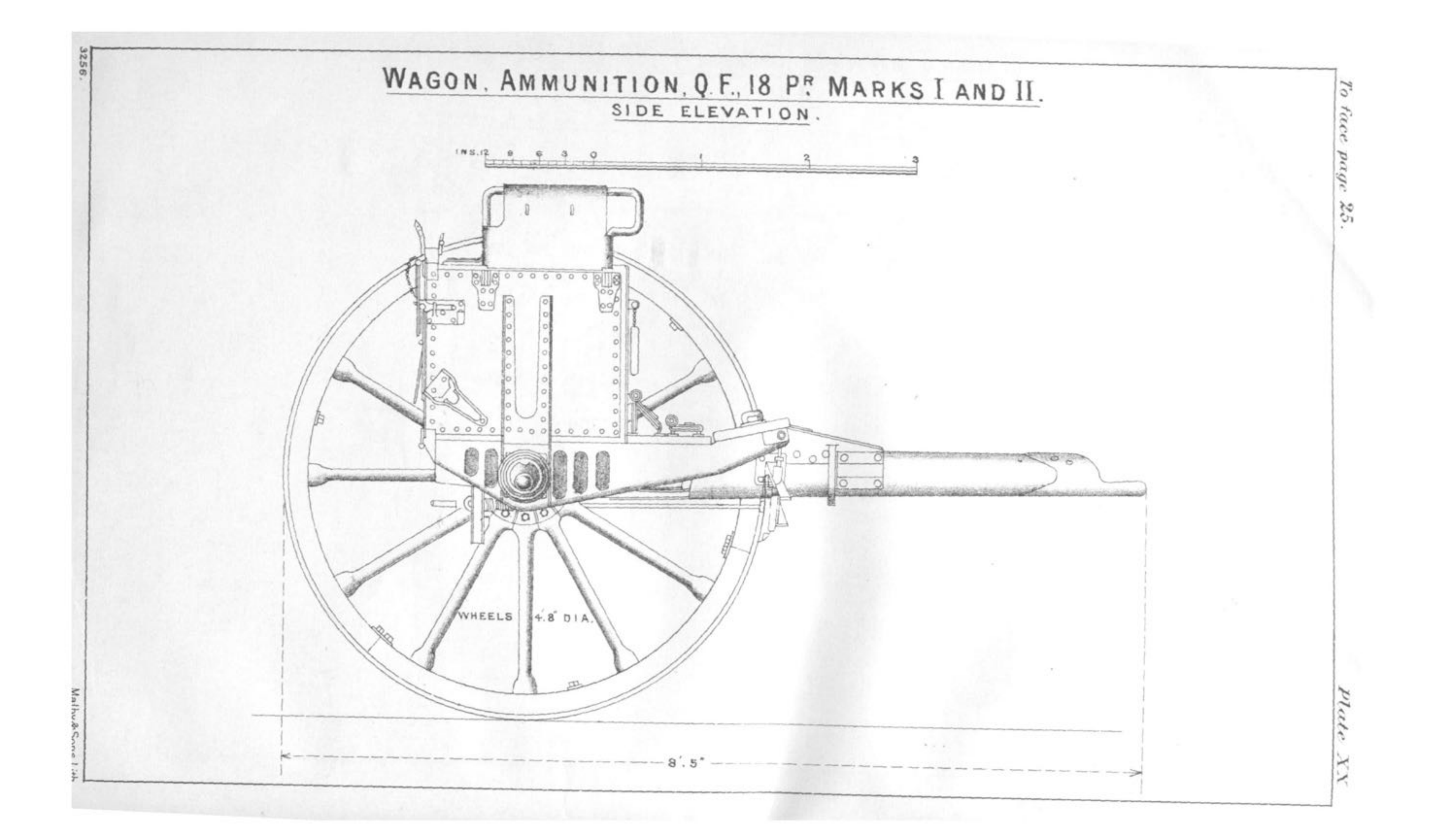
Malby & Sons, Lith.

Plate XVII



3256.
LIMBER, Q. F., 18 PR. WAGON, MARKS I AND II.
SIDE ELEVATION.
INS. 12 9 6 3 0 1 2 3 FEET.
WHEELS 4'.8" DIA.
5'. 4".5
14'. 2"
Malby & Sons, Lith.
To face page 25.
Plate XVIII.


LIMBER, Q.F., 18 PR., WAGON, MARKS I AND II.
REAR ELEVATION.
INS 12 9 6 3 0 1 2 3 FEET
5'. 2".
5'. 3".
6'. 3".
To face page 25.
Plate XIX
3256.



3256.
WAGON, AMMUNITION, Q.F., 18 PR. MARKS I AND II.
SIDE ELEVATION.
INS.12 9 6 3 0 1 2 3
WHEELS 4.8" DIA.
8'.5"
To face page 25.
Plate XX

3256.

To face page 25.

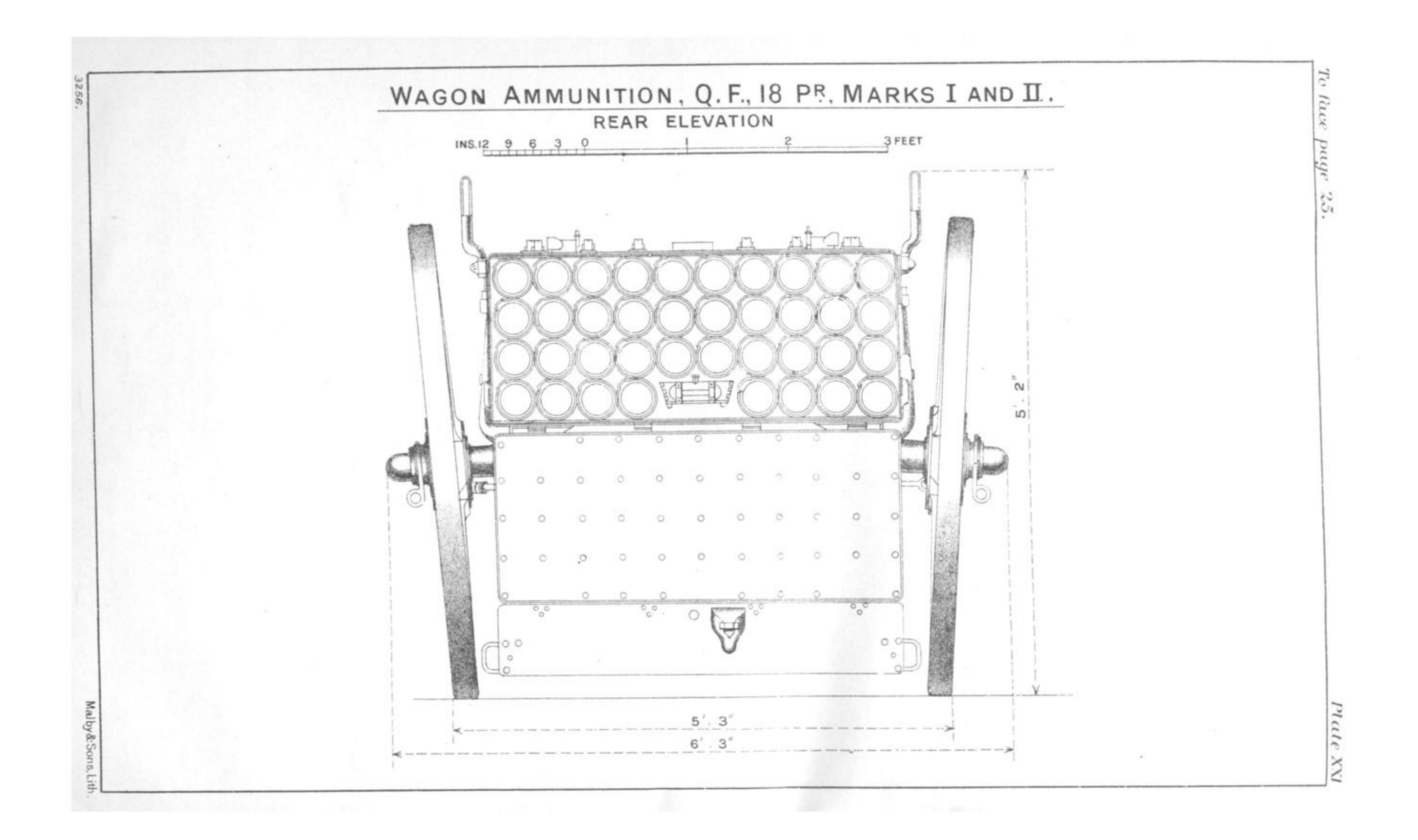


Plate XXI

Malby & Sons, Lith.

The Mark II limber differs from Mark I only in being fitted with tubular baskets instead of brass tubes for carrying the ammunition.

The wheels are the same as those described for the carriage.

Half the limbers per battery will be fitted with loops for kicking straps.

Limber, Q.F. 18-pr., Wagon, Marks I and II.

(Plates XVIII and XIX.)

The wagon limber differs from the carriage limber principally in the form and capacity of the ammunition box, which is constructed to carry 38 rounds, and one tray for small stores. It is provided at the rear with three lids, one on each side, and one in the centre. The side lids are fitted with shield plates, and hang below the limber frame, as in the carriage limber; the centre lid is hinged at its upper edge, and rests on the top of the box when open.

Wagon, Ammunition, Q.F. 18-pr., Marks I and II.

(Plates XX and XXI.)

The Mark I wagon consists of a steel frame, a hollow box perch fitted with a perch eye, a steel ammunition box, a brake gear, a 2nd class axletree, and two field wheels.

The frame consists of two flanged sides connected by stays; platform and foot boards are fitted to the sides and perch in front, and a shelf is fitted under the platform board on each side of the perch to carry a 14-lb. grease box.

The perch, which is connected to the frame by the side stays and platform boards, is plugged at the front end with hard wood. It is fitted with locking plates and a No. 13 perch eye.

The ammunition box is the same as for the wagon limber, with a shield plate similar to that for the carriage limber. Fittings are also provided for the fuze indicator.

A tire brake is provided, which acts on the front of the wheels and is actuated from the rear by a hand wheel.

The wagon is fitted to carry a spare jointed pole and the various stores as shown in Packing Diagram B, page 46.

The axletree is 2nd class "C" No. 208. The wheels are similar to those for the wagon limber.

The Mark II wagon differs from Mark I only in being fitted with tubular baskets instead of brass tubes for carrying the ammunition.

Note.—To facilitate the extraction of ammunition from the baskets the leather work of the basket should be kept soft by grease. The baskets will be tested periodically and if necessary, rectified by the insertion of a dummy round.

DIMENSIONS, &c.

	Carriage and Limber.		Ammunition Wagon and Limber.	
	ft.	ins.	ft.	ins.
Height — to axis of gun	3	0·86	—	
Height — to line of telescope	3	8·01	—	
Height — to line of sight	3	9·11	—	
Height — maximum — carriage, without dial sight	4	8·75	—	
Height — maximum — limber	4	9	—	
Height — maximum — wagon and limber	—		5	2
Width, maximum	6	3	6	3
Length of — carriage with gun	13	8	—	
Length of — limbers — carriage — with pole	14	2	—	
Length of — limbers — carriage — without pole	5	4·5	—	
Length of — limbers — wagon — with pole	—		14	2
Length of — limbers — wagon — without pole	—		5	4·5
Length of — wagon	—		8	5
Length — between axletrees	9	11	7	4·75
Length — with pole (end of pole on ground)	27	4·5	21	5·5
Length — without pole	18	9	12	11
Greatest projection beyond track of wheels	—	6	—	6
Wheels — track	5	3	5	3
Wheels — height	4	8	4	8
Space required to turn in	32	0	28	0
	deg.	min.	deg.	min.
Angle of — lock	71	0	64	0
Angle of — trail (spade buried)	14	18	—	
Upsetting angle	39	30	35	30
Elevation, maximum	16	0	—	
Depression, maximum	5	0	—	

	Telephone Wagon.	
	ft.	ins.
Body — height	4	8
Body — length	9	10
Body — width (maximum)	6	4
Limber — height	5	6
Limber — length — with pole	14	3
Limber — length — without pole	5	3
Limber — width (maximum)	6	4
Body and limber — length — with pole	23	0
Body and limber — length — without pole	14	2
Body and limber — length between axletrees	7	7
Body and limber — space required to turn in	28	6
Body and limber — angle of lock		62°
Body and limber — upsetting angle		32°
	ft.	ins.
Wheels — height	4	8
Wheels — track — body	5	3
Wheels — track — limber	5	4

AVERAGE WEIGHTS.

(Fully packed with ammunition and stores, but without men or personal equipment.)

	Weights. cwt.	qr.	lb.
Carriage with gun	25	0	21
Limber, carriage	15	1	0
Limber, wagon	19	0	0
Wagon, ammunition, with spare jointed pole	19	3	17
Wagon, ammunition, without spare jointed pole	19	1	17
Carriage and gun with limber	40	1	21
Wagon, ammunition, and limber, with spare jointed pole	38	3	17
Wagon, ammunition, and limber, without spare jointed pole	38	1	17
Carriage and limber, weight on fore wheels	16	0	21
Carriage and limber, weight on hind wheels	24	1	0
Wagon, ammunition, and limber, weight on fore wheels with spare jointed pole	20	2	5
Wagon, ammunition, and limber, weight on hind wheels with spare jointed pole	18	1	12
Wagon, ammunition, and limber, weight on fore wheels without spare jointed pole	20	0	14
Wagon, ammunition, and limber, weight on hind wheels without spare jointed pole	18	1	3
Weight on pole at tug 3rd hole from front end (limbered up), carriage and limber, without men	—	—	24
Weight on pole at tug 3rd hole from front end (limbered up), carriage and limber, with 2 men on limber	—	1	4
Weight on pole at tug 3rd hole from front end (limbered up), wagon and limber, without men	—	—	20
Weight on pole at tug 3rd hole from front end (limbered up), wagon and limber, with 2 men on limber	—	1	0
Carriage—			
Pressure of trail on ground	1	0	8
Pressure of trail on limber hook	—	3	4
Wagon, ammunition—			
Pressure of perch on ground, with spare jointed pole	1	3	16
Pressure of perch on ground, without spare jointed pole	1	3	4
Pressure of perch on limber hook, with spare jointed pole	1	0	20
Pressure of perch on limber hook, without spare jointed pole	1	0	0
Wheel, 2nd Class "C" No. 43	1	2	10
Wheel, 2nd Class "C" No. 45	1	3	10
Telephone wagon, limber without stores	6	1	0
Telephone wagon, limber complete with stores	8	2	13
Telephone wagon, body without drums and stores	7	0	0
Telephone wagon, body complete with stores	9	1	0

SEPARATE DEMANDABLE STORES.

APPARATUS, ADJUSTING RUNNING OUT SPRINGS, Q.F. 18-PR., MARK I.

The apparatus consists of a steel screw with locking nut, clip, and actuating nut with handle. The method of attaching the apparatus to the hydraulic buffer is as follows:—

(a) Insert the V-screw thread on the screw into the hole for its reception in the rear end of the controlling plunger as far as it will go (care being taken that the locking nut is screwed back against the collar on the screw), and tighten up the locking nut against the face of the plunger.

(b) Place the clip over the screw, and insert the two studs into corresponding holes in the rear of the spring case.

(c) Screw the actuating nut, with handle, against the rear end of the clip.

FUNNEL, FILLING HYDRAULIC BUFFER, MARK II.

The funnel, which is of leather, is for use in filling the cylinder of the hydraulic buffer.

SYRINGE, Q.F. 13 AND 18-PR., MARK I.

The syringe is for extracting liquid from the hydraulic buffer (*see* Care and Preservation in "Regulations for Magazines and Care of War Matériel").

TOOLS, PACKING GLAND, Q.F., 18-PR.—
COLLAR, MARK I.
PLUG, MARK I.

The collar and plug are for use in packing the stuffing box of the hydraulic buffer.

The collar is for assisting the asbestos packing ring over the shoulder of the piston rod.

The plug is for removing the packing and supporting rings, and packing washers, from the stuffing box.

TOOL, WITHDRAWING RING SUPPORTING PACKING, Q.F. 13 AND 18-PR., MARK I.

The tools are for withdrawing the outer ring supporting packing from the stuffing box of the hydraulic buffer.

WAGON, GENERAL SERVICE, MARKS IX TO X*.

The Mark IX wagon consists generally of the following parts:—body, under carriages, seat, floating raves, brake, axletrees, and wheels. It is fitted with a 4-inch roller scotch, whip socket, and two grease boxes.

The body is separate from, but rests on, front and rear under carriages. Allowance is made on the front carriage for slight longitudinal motion, to ensure flexibility to the vehicle for rough travelling. The rear under carriage has two straight guides, which are continued slightly beyond the body.

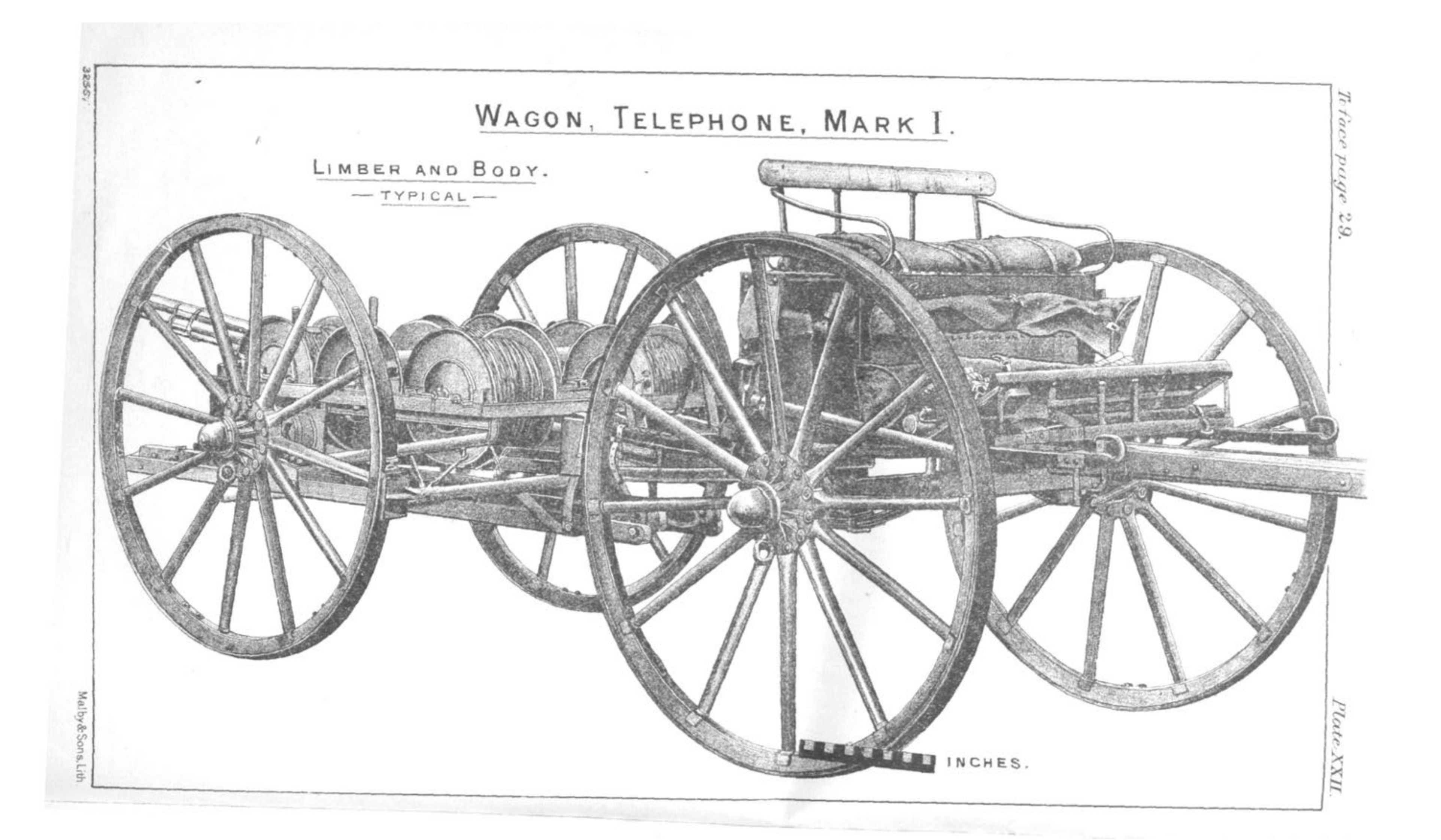
A locker is formed on the front part of the wagon; the locker is bevelled off to allow the fore carriage to have a greater sweep, and thus minimise the space in which the wagon can turn.

The wagon is fitted for pole draught, which consists of a No. 7A pole and two No. 10A or 11 swingletrees.

The splinter bar is strengthened by iron stays, which are formed with hooks at the front for the attachment of the swingletrees.

The driver's seat is supported on elliptical springs, to afford easy riding; the springs are fitted to a cross bar, with ends formed to fit over two wooden standards, and are kept from being too lively by two leather straps, the seat being fastened to the standards by keys.

The brake, which acts on the rear of the hind wheels, is applied from the driver's seat by a hand lever, or from the rear of the wagon by a handle operating a screw. The hand lever is connected by a flexible wire rope on the offside of the wagon to a lever, secured to the guides of the rear under carriage, and fitting into a loop attached to the rear axletree bed. A brake screw is connected with this lever and a wooden cross bar, which carries the brake blocks, and which is



WAGON, TELEPHONE, MARK I.

Plate XXII.

To face page 29.

3256.

To face page 29.

WAGON, TELEPHONE, MARK I.

LIMBER.

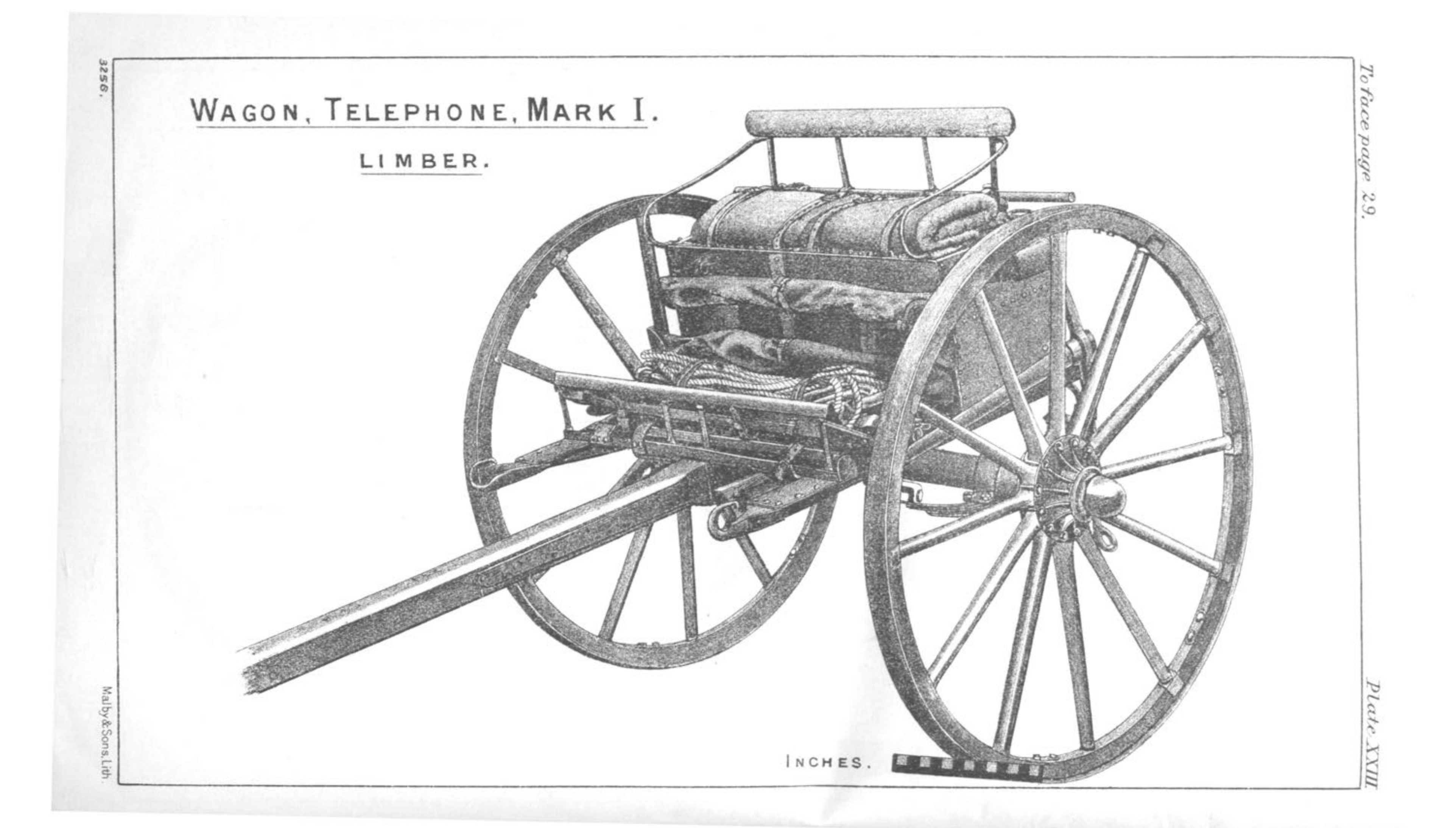


Plate XXIII.

Malby & Sons, Lith.

supported by brackets secured to the end of the guides. When the hand lever is pushed forward, the blocks are forced against the wheels. A rack retains the hand lever in position when the brake is applied, and a spring fixed behind the lever serves to ease the blocks off the wheels when the hand lever is released.

The fore axletree is 3rd Class "B," No. 174, and the hind, 2nd Class "C," No. 200. The wheels are 3rd Class "B," No. 159, and 2nd Class "C," No. 200, being 3 feet 9 inches and 4 feet 8 inches in diameter, respectively, with 2½-inch tire.

The cover is made of waterproof canvas, and can be adjusted to suit varying heights of loads, having on the outside two rows of tabs with eyelet holes, and on the under side, and the hem side, lines of white rope. Brass eyelets are secured at intervals along the hem.

The cover is secured to fitments on the wagon by lashings, which should be passed through a row of eyelets on each side and on the back, according to the height of load to be covered.

The side lines of white rope on the under side are for use in reefing the cover when small loads are carried in the wagon; the four on the hem are to keep the cover clear of the wheels.

The sides and rear of the cover not required should be rolled up and stowed away inside, the front portion being stowed behind the driver's seat on full and half-loads.

Weight	16 cwt. 3 qrs. 25 lbs.
Minimum space in which the wagon can turn	39 ft.
Tonnage { for shipment	6·754 tons.
Tonnage { for transport in boats	10·112 tons.
Rectangular space occupied in boats	12 ft. 8 ins. × 6 ft. 0¾ in. × 5 ft. 3 in.

Mark X is generally similar to Mark IX, but of rougher make, and is fitted with a sweep bar. Weight, 15 cwt. 2 qrs. 17 lbs.

Mark X* is the Mark X wagon provided with dust capped wheels and fittings, Nos. 200A (hind) and 159A (fore). Weight, 15 cwt. 3 qrs. 12 lbs.

WAGON, TELEPHONE, MARK I.

(Plates XXII and XXIII.)

The wagon consists of body and limber and is constructed to carry electric cable on drums, and other stores for field telephone operations, as shown in the diagram of packing, page 47.

BODY.

The body consists principally of a framework of steel plate with perch and axletree, mounted on two wheels and fitted with brake and winding gear. The framework consists of four futchels (two inner and two outer) held together by front and rear crossbars, the connecting stays being secured to the axletree by flanges. The two inner futchels are prolonged at the front to form a perch to which a perch eye is fitted. Locking plates are riveted to the inner futchels at the front. The operator's seat and footrest are fitted at the rear of the wagon on the near side. There are also two pole guard handles fixed at the rear.

The cable drums are of steel plate and are carried three on the near and three on the off side—the front and rear pair each carrying one mile of D 3 electric cable.

Brakes for front drums are fitted, one on each side, to regulate the speed of the drums when travelling. They are of the screw pattern and are actuated from the rear by a handwheel.

The winding gear is fitted to the near side of the wagon and consists of sprocket wheel and pinion and roller chain. The sprocket wheel is actuated by a pawl engaging into a bracket* secured to nave of near wheel. The driving strap is adjusted by means of a screw connected to the carrier and is actuated by a handwheel; by this arrangement of the gearing, the gear can be connected, or disconnected, with either the centre or rear drum on the near side. A drum must be in either of these positions to be operated by the gear. Each drum is interchangeable. When winding in the cable, if the speed of the drum is too fast, it can be regulated by slackening the band by means of the actuating handle, so that the band may slip slightly.

The axletree is 2nd Class "C," No. 194 and the wheels No. 198A.

The brake gear is of the screw pattern actuated from the rear; the bar is of tubular steel suspended from the frame by steel links, attached to brackets which are riveted to the frame; the brake blocks are of cast iron.

Eight telegraph poles are carried on the centre portion of the frame, resting at the rear end on top of, and strapped to, the rear crossbar and passing under the front crossbar, the ends rest on a leather padded steel plate, to which the poles are also strapped.

A field telegraph ladder is carried under the body of the wagon secured by straps.

LIMBER.

The limber consists principally of a framework with axletree and springs, a box, and draught fittings mounted on two wheels.

The framework consists of four futchels (two inner and two outer) connected by plates; draught hooks are fixed to the front end of the outer futchels and a No. 32 limber hook to the frame at the rear.

The box is made of steel plate and is riveted to the frame. It is divided into compartments for carrying the portable telephones, electric cells and other stores. The top is fitted with a back rest and guard irons, which together form a seat.

The wheels and axletree are the same as for the body.

The draught fittings consist of a Mark III No. 17 pole, a Mark II No. 3 bar, supporting pole, and two No. 11 swingletrees.

For particulars of stores carried both inside and outside, *see* list of stores, pages 43 and 44, also packing diagram C. Strapping is provided both on the limber and wagon for securing those stores which are to be carried externally.

SPECIAL PRECAUTIONS.

With a keyless limber hook, the limber is not prevented from turning over, *when unhorsed*, by a limber hook key; therefore, to prevent accidents, when a vehicle (having this form of limber hook) is limbered up, the pole must not be allowed to rise above the horizontal unless it is kept under proper control.

* This bracket will be regarded as a component of the wagon and attached to the wheel as required so that the interchangeability of the wheel will not be affected.

CARE AND PRESERVATION OF CARRIAGES, &c.

See "Regulations for Magazines and Care of War Matériel."

List of Lubricating Holes.

Fittings which are provided with oil holes for lubricating purposes.	No. of Holes.	Position of Holes.
Carriage.		
Capsquares (2) ... ... each	1	
Carriage body—		
Bearings, axletree (2) ... "	1	In lubricating cup, 1 on each side.
" clutch spindle (2) "	1	Inside carriage body, 1 on each side.
Cap, lower bracket of elevating gear	2	In bearing portion for handwheel spindle on left side.
Cradle—		
Body	8	7 in sides for oiling sliding surfaces, and 1 on left side at rear, with tube for lubricating handwheel spindle.
Bearing, pinion, spindle handwheel	1	On right side close to handwheel.
Gear brake—		
Bolts, connecting, cranked levers (3), each	1	2 on left side and 1 on right, close to shield.
Bolts, connecting, eccentric link	1	In head of bolt, right side } near brake blocks.
Bolts, connecting, fork actuating screw ...	1	In head of bolt, left side } near brake blocks.
Fork, actuating screw	1	On right side.
Link, eccentric	1	On left side.
Gear, elevating—		
Rod, connecting elevating screw ...	1	In lower end.
Gear, firing—		
Arm, connecting	1	In upper end, left side.
Rod, connecting	2	1 at each end, left side.
Bracket, connecting arc, range gear ...	1	On left side.
Bolts connecting brake arms (2) each	1	In head of each bolt.
Crosshead, traversing gear	1	
Lever, traversing	1	At jointed end of lever, near plunger.
Sight, rocking bar	1	For oiling arm trunnion supporting sight.
Wheels, 2nd Class, "C," No. 45 (2) each	1	In inner flange.
Wagon, Ammunition.		
Levers, cranked brake gear, near...	1	} Rear of wagon.
Levers, cranked brake gear, off ...	1	} Rear of wagon.

Note.—In order to assist in identifying the position of the lubricating holes, the heads of the screws should be kept free from paint.

AMMUNITION.

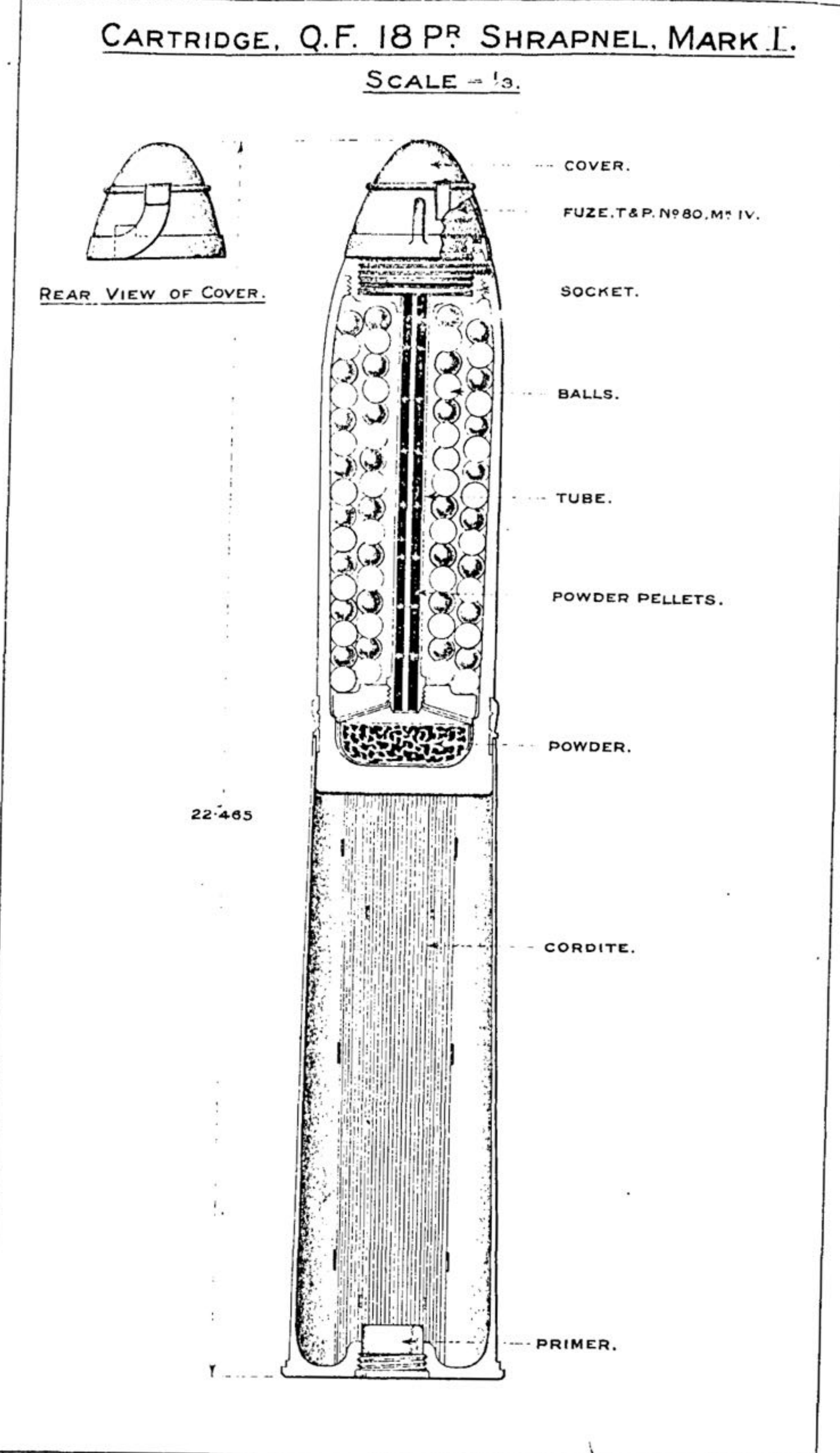
Description.	Mark.	Weight of Cartridge Case with Primer.	Charge.		Shell.				Nature of Fuze.	Total Weight of complete Round.	Means of Firing.
			Nature.	Weight.	Mark.	Bursting Charge. Nature.	Bursting Charge. Weight.	Weight filled and fuzed.			
		lb. oz.		lb. oz.			oz. drs.	lb. oz.		lb. oz.	
Cartridge Q.F. 18-pr.—Shrapnel	I	2† 15	Cordite M.D. size 8.	1 6$\frac{15}{16}$	I, II and III	R.F.G.^{2}, blank F.G. new, S.F.G.^{2}, or Q.F.F.G.	2 8*	18 8	T. & P., No. 80	22 13$\frac{15}{16}$	Percussion (Primer, percussion Q.F cartridges, No. 1).
Star ..	I	2† 15	Cordite M.D. size 4½.	0 8	I	R.F.G.^{2}	0 3¼	10 3	Time, 15 secs., No. 25	13 10¼	
Blank, 1 lb., blank, L.G.	I and II	2† 15	Blank, L.G.	1 0	—	—	—	—	—		
Blank, 7 oz., smokeless blank	I	2† 15	Smokeless blank.	0 7	—	–	—	—	—	—	

* Includes powder pellets, weight ¾ oz.

† A certain number of "light" cartridges have been issued, the cases of which weigh 2 lb. 5 oz. each.

CARTRIDGE, Q.F. 18 Pr. SHRAPNEL, MARK I.

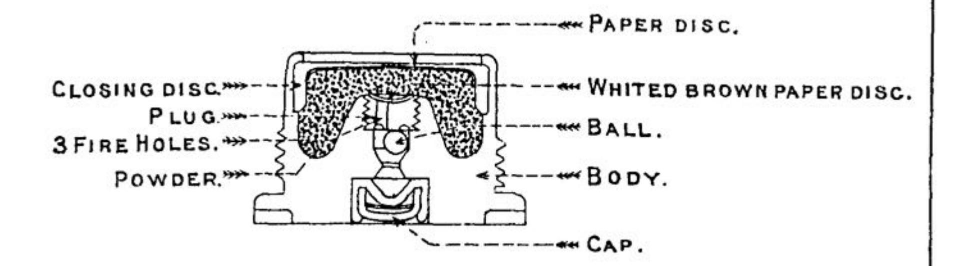
SCALE = 1/3.



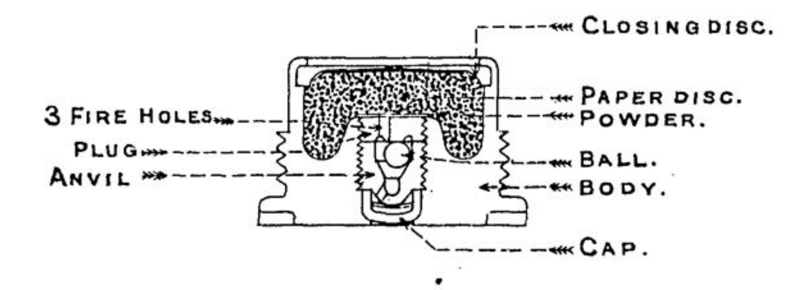
PRIMER, PERCUSSION, Q.F. CARTRIDGES, No. I.

SCALE = 1/1.

MARK I*.



MARK II.



3256 Malby & Sons, Lith.

GENERAL INSTRUCTIONS FOR CARE AND PRESERVATION OF AMMUNITION.

The following points should receive special attention :—

(*a*) Care must be taken not to injure the cartridge cases or fuze covers when withdrawing the rounds from the four round boxes or the vehicles.

(*b*) The rounds should not be carried by the clip tapes nor rested on the fuze covers.

(*c*) The rounds should on no account be stacked on their ends, but on their sides, and then not more than two tiers high.

(*d*) In cases where fuze covers have become detached, the rounds will be returned to the Army Ordnance Department.

(*e*) When necessary, the shell should be wiped over with boiled linseed oil, care being taken to avoid the fuze.

(*f*) Primers, if found to be unscrewed, should be tightened up.

(*g*) As the time pellet with detonator lies near the point of the fuze and is protected only by the aluminium cap, rounds should be so handled as to avoid all risk of the fuze being knocked.

CARTRIDGE, Q.F., 18-PR., SHRAPNEL, MARK I.

(*Plate XXIV.*)

The ammunition is fixed and a complete round consists of a cartridge case with percussion primer, charge, shrapnel shell, and fuze.

The *case* is of solid drawn brass, slightly tapered towards the mouth, and has a hole in the base screwed and recessed to take a percussion primer. The cases are black lacquered (formerly " dulled ") so as to render them as inconspicuous as possible.

The *charge* consists of a 1 lb. $6\frac{15}{16}$ oz. bundle of cordite M.D. size 8, recessed at one end to fit over the primer and the boss of the case, the other end being in contact with the base of the shell.

The *No. 1 Mark II percussion primer* (Plate XXV) consists of a metal body, screwed externally for a portion of its length to fit the primer hole in the cartridge case. The interior is bored and recessed to take a cap which is secured by a screwed plug; this plug has an anvil at one end, the other end being bored out to form a sealing chamber, and contains a soft copper ball to seal the escape of gas after firing and relieve the pressure on the cap. The sealing chamber is closed by a perforated screwed plug.

The body is filled with R.F.G.[2] powder, the mouth being closed with a brass closing disc having six radial slits.

Two small recesses are formed in the flange of the head for the primer key.

The *Mark I* primer* (Plate XXV) differs from Mark II in the head being recessed to receive a brass chamber containing a cap. This cap chamber forms the anvil and has three fire holes; it is connected with the gunpowder charge in the body by a channel which contains a soft copper ball in a coned seating, and which forms the sealing chamber.

The *Mark III shrapnel shell* has a steel body with a recess in the base to contain the tin cup for bursting charge. The head of the shell is struck with a radius of two diameters, and is fitted with a

2-in. brass fuze socket. A brass tube containing perforated powder pellets conveys the flash of the fuze to the bursting charge, one end of the tube being fitted into the fuze socket, the other being screwed into a steel disc placed over the tin cup.

The shell contains 375 mixed metal bullets (41 per lb.) and is fitted with a copper driving band in a groove having two waved ribs.

The shell is secured in the case by the edge of the latter being pressed into the groove of the driving band. The shells are painted lead colour to distinguish them from the Mark I.

The *Mark II shell* differs from the Mark III in having a slightly narrower driving band. The shell is secured in the case by the latter being indented in four places into a cannelure turned on the shell, the cannelure being filled with Pettman's cement.

The *Mark I shell* differs from the Mark II in the radius of the head being $1\frac{1}{2}$ diameters. The walls of the shell are thinner in the lower part, and the lid of the tin cup containing the bursting charge is also of a different shape. It contains 364 bullets.

Shell of early manufacture will take Mark I fuze covers only, but in later manufacture the fuze socket has been slightly modified, and such shell will take covers of later marks.

Mark I shell are painted black.

Cartridge, Q.F., 18-pr., Star Shell, Mark I.

(*Supplied when specially ordered only.*)

The complete round consists of a cartridge case with percussion primer, charge, paper cylinder, star shell and fuze.

The *No. 1 Mark I* or II percussion primer* described on page 33 will be used with this ammunition.

The *charge* consists of 8 oz. of cordite M.D. size $4\frac{1}{4}$ in a circular bundle, recessed at one end to fit over the boss inside the case and to permit of the insertion on the percussion primer. It is held in position in the case by the perforated paper cylinder with two perforated discs at each end, an unperforated disc being also secured to the end that comes in contact with the cordite charge.

The *star shell* has a steel body recessed in the base to receive a bursting charge of $3\frac{1}{4}$ drams R.F.G.^{2} powder contained in a shalloon bag and threaded with quick match.

The head of the shell, which is fitted with a metal G.S. fuzehole socket, and a wood block, is attached to the body with 6 brass screws and 6 steel twisting pins.

A metal central tube, perforated with 12 fireholes, is screwed into a wrought iron diaphragm over the bursting charge and is fitted at the top into the fuze socket.

The interior of the shell, which is "velvrilled" and lined with brown paper, contains 10 stars in tiers of 5. A perforated iron disc separates the tiers, and is supported by wood supports which are placed between the stars in each tier.

The faces of the disc are covered with felt washers, and a felt washer is placed between the top of the stars and the wood block in the head.

The ribs of the groove for driving band are waved.

The "Fuze. time, 15 seconds, No. 25," will be used with this shell.

CARTRIDGE, Q.F., BLANK, 18-PR.

The Mark II blank cartridge consists of a service case and percussion primer with a charge of 1 lb. blank L.G. powder contained in a No. 1 class silk cloth bag, having three silk braid hoops and, together with a felt disc with lifting loop, enclosed in a felt jacket. The mouth of the cartridge is closed with a split paper ring and leather-board cup by means of the wood drift supplied for the purpose.

The Mark I blank cartridge differs from the Mark II in the bag having two hoops instead of three, and in having a shorter and narrower lifting loop.

CARTRIDGE, Q.F., BLANK, 18-PR., FILLED, 7-OZ., SMOKELESS, BLANK, MARK I.

This blank cartridge consists of a service case and percussion primer, with a charge of 7 oz. smokeless blank and about 4 oz. 5 drs. of matchwood shot. It is closed with a split paper ring and leather-board cup by means of the wood drift supplied for the purpose.

The empty cases for making up blank locally are issued 20 in a "Box, cartridge cases Q.F. 18-pr."

Instructions for making up blank and smokeless blank cartridges with charges issued for the purpose, as may be necessary from time to time, will be found on the lid of the box in which the empty cases are received.

CARTRIDGE, DUMMY, Q.F., 18-PR.

This dummy cartridge is for use in practising fuze setting. It consists of an empty service shell body secured in a service case in the usual manner and further secured by a bolt, one end of which is fitted into the primer hole of the cartridge and the other end screwed into the base of the shell.

The shell is fitted with a 2-inch fuze hole socket closed at the bottom, and is filled with a mixture of dust and lead ash.

The cartridge case contains a wood block which is recessed at one end to fit over the boss in the base. Four holes are bored in the side and three in the base of the case, for ready identification of the dummy cartridge.

CARTRIDGE, Q.F., 18-PR.—CASE DRILL.

The drill case consists of an empty service case with the mouth plugged with a hard wood disc about 1-in. thick, and of a diameter to ensure a good fit in the case. Six of these cases with a drill primer are allowed to Batteries for drill purposes generally.

The drill primer consists of a body of the same external shape as a service primer, but bored out to take a hard rubber plug which is held in position by a screwed plug. It is stamped "DRILL" on the head.

Fuze, Time and Percussion, No. 80.

(Plate XXVI.)

The Mark IV fuze is made of aluminium, except where otherwise stated, and consists of the following principal parts:—Body with brass ring, top and bottom composition rings, two waterproofed cloth washers, cap with set screw, base plug, time and percussion arrangements, and brass cover.

The lower portion of the body is screwed to receive a holder for the percussion arrangement, and the upper portion forms a stem containing the time detonator pellet and its stirrup spring. The shoulder or flange of the body is fitted with a brass ring, to the lower part of which the fuze cover is secured. The upper part of the brass ring is graduated from 0 to 22, each graduation being divided into 10 parts; a square notch is cut for the No. 17 Mark II fixing key, and a small cross to denote safety point. A recess is turned on the under side of the brass ring to fit over the nose of the shell, and is provided with a leather washer soaked in mineral jelly.

A pin is screwed into the lower time ring to form a projection by means of which the ring is set with the No. 18 setting key. A setting mark is cut on the ring.

The upper time ring is prevented from turning by two pins.

The cap is screwed on to the body over the upper time ring and closes the fuze. It is secured in position by a set screw.

The base plug is screwed externally to fit the bottom of the body.

The holder percussion arrangement carries the needles of both the time and percussion detonator. It is bored to receive the percussion detonator pellet, ferrule, stirrup spring, and spiral spring.

All the external joints, escape holes, &c., are waterproofed.

The cover is of brass, and consists of a cap, ring, tearing off strip, and strip securing ring.

The tearing off strip, having the brass ring attached at one end, is soldered round the cap, the brass ring being placed over the nose of the cap and held in position by the securing strip. The cap is soldered to the lower edge of the brass ring on the body of the fuze.

To remove the cover from the fuze, tear off the strip securing ring, then the tearing off strip, when the cap will fall off, leaving the fuze exposed.

The fuze when set full should burn, at rest, for about 22 seconds.

To set the fuze, turn the setting mark on the lower ring, by the setting key, opposite the graduation required.

Action.—Time arrangement. On shock of discharge, the detonator pellet sets back on the needle, straightening the clips of the time stirrup spring, firing the detonating composition and so igniting the composition of the top ring, which in succession lights that in the lower ring, and so fires the fuze.

Percussion arrangement. On shock of discharge, the ferrule sets back over the detonator pellet, straightening the clips of the percussion stirrup spring; the whole is then set free to move forward on impact or graze, and after compressing the spiral spring, the detonator upon striking the needle ignites the composition, and so fires the magazine.

Weight of fuze ... ... $10\frac{1}{4}$ oz.

To face page 36.

FUZE, TIME AND PERCUSSION, No. 80, MARK IV.

SCALE = 1/1.

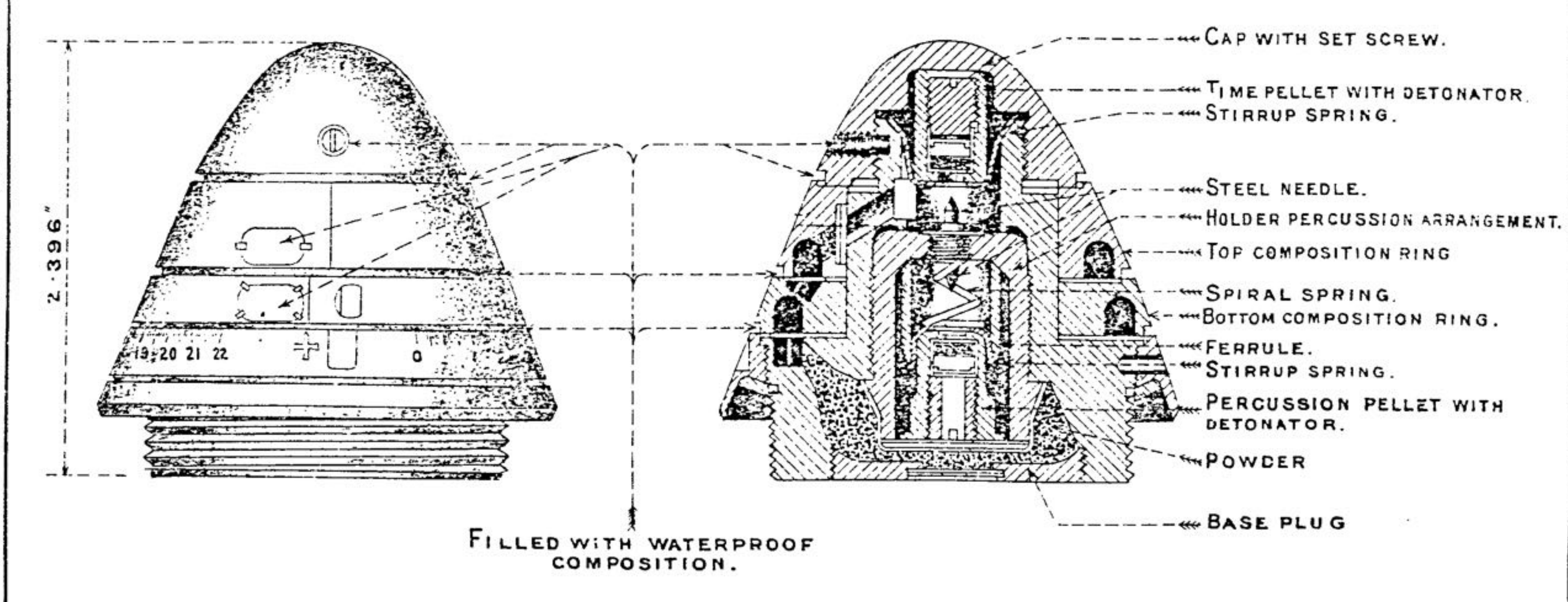


Plate XXVI

3236
Malby & Sons Lith.

A tin cylinder to hold one fuze, if required, will be known as "Cylinder No. 80. F"; it is painted green and has yellow labels.

Some fuzes have been issued which bear no numeral, lot number, or date of manufacture, but are only marked on the cover with the design number (16603 A). They differ from the Mark IV in the shape of the brass ring and other minor details.

The Mark III fuze differs principally from the Mark IV in not having the brass ring round the flange of the body for the purpose of fitting the cap.

The Mark II fuze differs from the Mark III in not being waterproofed in its external joints. When existing Mark II fuzes have been waterproofed, they will be known as Mark II.*

Fuzes that have been refilled will have the letter "R" placed after existing numeral.

Marks II and III fuzes are fitted with "Cover, fuze, time and percussion, No. 80, Mark II," which is of brass, and consists of the following parts:—Cap, a screwed ring with brass ring and tin band, and a washer.

The cap is shaped to fit over the fuze, and has a screw thread to engage with the thread on the screwed ring.

The brass ring is shaped to fit the nose of the shell, and is attached to the screwed ring by means of the tin band.

To remove the cover from the fuze, tear off the tin band, when the cap, together with the screwed ring, will fall off, leaving the fuze exposed.

Weight of cover ... ... $2\frac{1}{2}$ oz.

Fuze, Time, 15 Seconds, No. 25.

The Mark III fuze is made of aluminium, and consists of the following principal parts, viz.:—Body, time ring, cap, safety pin, detonator pellet with detonator, stirrup spring, needle plug, magazine, bottom plug, and leather washer.

The lower portion of the body contains the magazine channel and magazine, and the upper portion forms a stem and contains the detonator pellet with detonator, and the needle plug. The shoulder of the body has a black mark to coincide with an arrow on the time ring, when set at safety.

The time ring, which is graduated from 0 to 44, is fitted round the exterior of the stem.

The cap fits over the time ring, on top of a steel spring washer, and closes the head of the fuze. It is secured, when in position, by a steel keep screw.

A copper safety pin, provided with a loop of red cord, passes through the top cap and the detonator pellet.

The detonator pellet is suspended by the safety pin and a stirrup spring, which is kept in position by its two clips.

The magazine contains about 45 grains of R.F.G.[2] powder, and is closed by means of the bottom plug.

The openings of the fuze are waterproofed to exclude damp.

Action.—On shock of discharge, the detonator pellet sets back, thereby straightening the clips of the stirrup spring, and being driven

on to the needle of the needle plug ignites the detonator, which fires the composition of the time ring, this burning till it reaches the magazine channel, thereby igniting the powder in the magazine.

Weight ... ... 5¾ oz.

Mark II differs from Mark III in not being waterproofed.

FUZE, DRILL, TIME AND PERCUSSION, NO. 80.

The drill fuzes resemble, generally, the service fuzes which they represent, and in some cases burnt out service time and percussion fuzes are converted for the purpose. They are blacked all over with the exception of the flange of the body and a space on each of the composition rings, which are left bright. The lower time ring is fitted with a steel setting pin.

To facilitate identification the drill fuzes are stamped "DRILL" on the cap.

CLIP, CARTRIDGE, Q.F. 18-PR., MARK I.

The clip is made of brass, cross-shaped so as to form four arms, the ends of which are turned in to form clips to engage with the rim of the cartridge case. One arm is painted red, and is slightly longer than the others, the clip portion being differently shaped, so as to spring over the rim of the cartridge. The other three arms are sand blasted and black lacquered. It has a canvas loop for withdrawing the cartridges from the baskets or tubes in the ammunition boxes of the limbers and wagons.

The clip protects the cap of the percussion primer, and in the case of vehicles fitted with the brass tubes, also serves to hold the cartridge in the tube as follows:—

The cartridge (with its clip fixed) is inserted so that the red arm engages with the extended portion of the rim of the tube. When fully inserted, the clip is given part of a turn, thus bringing the end of the red arm inside the rim of the tube, and locking the cartridge in position.

CLIP, SAFETY, FUZE, TIME AND PERCUSSION, NO. 80, MARK I.

The clip is of steel, horseshoe shaped, and fits round the No. 80 time and percussion fuze, retaining it at "safety." The clip has a slot in it to fit over the setting pin, and a tongue-piece fitting into the fixing slot; the ends also have projections which fit under the edge of the body of the fuze.

KEY, NO. 17, FIXING NOS. 80 AND 83 FUZES.

The Mark II key is of steel, one end being shaped to fit over the fuze; the lower edge of the ring portion is bevelled to suit all Marks of No. 80 fuzes without covers, and is provided with a projection to fit the square notch in the flange of the fuze body. The upper edge of the ring is provided with a slot to fit over the projection on the cover when screwing in Mark IV., No. 80 fuzes with cover.

The Mark I key differs from the Mark II in the upper edge not being prepared for use with Mark IV fuzes with cover.

KEY, No. 18, SETTING Nos. 80 AND 83 FUZES.

The Mark I key is for use when the lower time ring is too stiff to set by hand. It is made of steel, and formed to engage with the pin projection of the lower time ring. It is provided with a loop of white line, 30 inches in length.

The Mark II key differs from the Mark I in the ring portion being of greater depth, thereby taking a better seating on the fuze.

Total length of key ... ... 6·17 inches.

KEY, No. 27, PRIMER 13 AND 18 PR.

This key is for use in inserting or removing the percussion primer in the cartridge. It is made of steel, and formed to engage with the two recesses in the head of the primer. It is also fitted with a white line lanyard.

Total length of key ... ... 13·1 inches.
" " lanyard ... ... 43 "

LIST OF STORES.

CARRIAGE.

Articles.	No.	Where carried.
Axe, pick	1	Under trail.
Brush, breech screw	1	In tool case, rear of shield.
Can, lubricating, No. 9	1	In wood block, rear of shield.
Carrier, No. 7, dial sight, No. 2..	1	On shield.
Case, keys, setting fuze†..	1	On shield.
Case, Mark III field clinometer†	1	On shield.
Case, sight clinometer†	1	On shield.
Case, spare parts†	1	On shield.
Case, spare sight clinometer	1‡	On left tensile stay.
Case, telescope†	1	On axletree.
Case, tools†	1	On axletree.
Cleaner, piassaba, No. 7	1	In tubular trail.
Cleaner, wool, No. 1	1	In tubular trail.
Clinometer, field, Mark III	1*	On rear of shield.
Clinometer, sight, Q.F., 13 and 18-pr. { (spare)	1‡	In case, on left tensile stay.
..	1	In case, on shield.
Cover, dial, sight, Q.F., 13 and 18-pr. . ..	1	On dial sight.
Cover, breech	1 }	On gun. When not in use,
Cover, muzzle, No. 1	1 }	strapped to front of shield.
Cover, eccentric, brake gear	1	On eccentric of brake gear.
Drift, No. 12	1	In leather case, on shield.
Funnel, filling hydraulic buffer..	1	In tool case, rear of shield.
Gauge, striker, protrusion, No. 1	1	In leather case, on shield.
Hammer, claw, 20-oz. (or 24-oz.)	1	In tool case, rear of shield.
Implements, ammunition—		
Keys, No. 18 (setting fuze)	2	In case, on shield.
Key, removing jammed cartridges, Q.F., 13 and 18-pr.	1‡	In tool case, A sub-section.
Lanyard, firing, No. 15	1	In tool case, rear of shield.
Oil, Rangoon .. .. pts.	½	In lubricating can.

* Per section. † Components of carriage. ‡ Per battery.

CARRIAGE—*continued.*

Articles.	No.	Where carried.
Ordnance, Q.F., 13 and 18-pr. :—		
Catch, retaining, breech screw (spare)	1	In leather case, on shield.
Pins, firing .. .. .. (spare)	2	In leather case, on shield.
Springs { main .. .. (spare)	2	In leather case, on shield.
Springs { safety catch .. (spare)	2	In leather case, on shield.
Springs { trigger .. .. (spare)	4	In leather case, on shield.
Springs { tripping piece .. (spare)	1	In leather case, on shield.
Striker .. .. (spare)	1	In leather case, on shield.
Pliers, flat nose .. .. pr.	1	In tool case, rear of shield.
Posts, aiming	2	On front of shield.
Ropes, drag, light, G.S. .. .. .. pr.	1	On front of shield.
Screw-driver, G.S., 4-in...	1	In leather case, on shield.
Shovels, G.S.	1	Right tensile stay.
Sight, dial, No. 7..	1	On shield.
Spanner, McMahon, 15-in. (or adjustable 15-in.)	1*	In tool case, rear of shield.
Spanner, McMahon, 9-in. (or adjustable 11-in.)	1	In tool case, rear of shield.
Spanner, No. 244†	1	In tool case, rear of shield.
Spanner, hydraulic buffer, No. 122†	1	In tool case, rear of shield.
Spanner, hydraulic buffer, No. 123†	1	In tool case, rear of shield.
Spanner, hydraulic buffer, No. 129†	1	In tool case, rear of shield.
Telescope, sighting No. 4	1	In case, on axletree, left side.
Tool, withdrawing split pins†	1	In tool case, rear of shield.

* Per section. † Components of carriage.

LIMBERS.

(Carriage and Ammunition Wagon.)

Articles.	Carriage.	Wagon.	Where carried.
Axes, { felling, curved helve	1	—	On platform board.
Axes, { pick	—	1	Under limber.
Bar, supporting draught pole, No. 3 (spare)	1	1*	On platform board.
Blankets, G.S.	2	2	On top of limber box.
Box, grease, 3-lb.†	1	1	Under platform board, "near" side.
Breast piece	1	1	On platform board.
Brushes, water, carriage	1	1	Under platform board, "near" side.
Buckets, water, G.S., canvas	12	6	In wire net receptacles.
Cans, lubricating, No. 3, { for Rangoon oil†	1	1	} Under platform board, "off" side.
Cans, lubricating, No. 3, { for mineral oil†	1	1	}
Carrier, ammunition, Q.F., 13 and 18-pr.	1	1	Under blankets.
Cartridges, Q.F., 18-pr., shrapnel.. ..	24	38	In ammunition box.
Clips, cartridge, Q.F., 18-pr.	24	38	On cartridges.
Cloths, sponge	5	5	Under tray, small stores.
Collars, adjusting, 2nd class, "C," capped wheels .. .. .. (spare)	1‡	1*	Tray, small stores.
Covers, rifle	2	2	On rifles, front of ammunition box.
Files { smooth, { flat, 6-in.	1	—	Tray, small stores, lower.
Files { smooth, { hand, safe edge, 6-in.	1	—	Tray, small stores, lower.
Files { second cut, half round, 6-in. ..	1	—	Tray, small stores, lower.
Grease, lubricating .. .. .. lbs.	3	3	In grease box.
Handle, file, small	1	—	Tray, small stores, lower.
Hooks, bill	1	1	Under platform board, "off" side.

* Per sub-section. † Components of limber. ‡ Lower tray.

Limbers—*continued.*

(Carriage and Ammunition Wagon.)

Articles.	Carriage.	Wagon.	Where carried.
Implements, ammunition—			
Holder, cartridge..	—	1§	Under tray, small stores.
Keys, No. 17 (fixing fuze)	1†	1	Tray, small stores.
Keys, No. 27 (primer)	—	1*	Tray, small stores.
Keys, No. 18 (setting fuze)	2†	2	Tray, small stores.
Key. split, flat, 1″ × 4″ .. (spare)	1†	1*	Tray, small stores.
Line Hambro	1	1	On platform board.
Oil, mineral (for buffers) .. .. pts.	2	2	In cans, lubricating.
Oil, Rangoon .. .. .. pts.	1½	1½	In cans, lubricating.
Pins, capsquare .. .. (spare)	1	—	Tray, small stores, lower.
Pins, keep, split, $\frac{1}{16}$ in. × 1¼ in.	1	—	Tray, small stores, upper (in rectangular tin box).
Pins, keep, split, $\frac{3}{32}$ in. × 1½ in.	1	—	
Pins, keep, split, $\frac{5}{32}$ in. × 1¾ in. .. (spare)	3	—	
Pins, keep, split, ⅛ in. × 1 in.	2	—	
Pins, keep, split, ⅛ in. × 2½ in.	1	—	
Pins, keep, split, ⅛ in. × 1¼ in. .. (spare)	9	—	
Pins, keep, split, $\frac{3}{16}$ in. × 1 in.	1	—	
Pins, keep, split, ¼ in. × 5 in.	1	—	Tray, small stores, lower.
Pins, linch, 2nd class, "C," capped wheels (spare)	1†	1*	Tray, small stores.
Pins, locking, shield pawl .. (spare)	1	—	Tray, small stores, lower.
Pins, draught, No. 3 .. (spare)	1†	1*	Tray, small stores.
Plugs, filling hole, hydraulic buffer, No. 12 (spare)	2	—	Tray, small stores, lower.
Primers, percussion, Q.F., cartridges, No. 1 (in tin box) .. .. (spare)	—	4	Tray, small stores.
Rings, packing, hydraulic buffer (spare)	2	—	Tray, small stores, upper, each in round tin box.
Ropes, drag, light, G.S. .. .. pairs	—	1	On platform board.
Screw-driver, G.S., 4-in.	—	1	Tray, small stores.
Screws, lubricating hole, boss-head, $\frac{5}{16}$ in. × ¼ in. .. .. .. (spare)	6	—	Tray, small stores, upper (in rectangular box).
Shovels, G.S.	—	2	On platform board.
	1	—	On side of box.
‡Spring, catch, limber and perch hooks (spare)	1	—	Tray, small stores, upper.
Springs, disc, No. 62 .. (spare)	2	—	Tray, small stores, lower.
Springs, firing gear .. .. (spare)	2	—	Tray, small stores, lower.
Springs, shield pawl .. (spare)	1	—	Tray, small stores, lower.
Springs, sight clinometer (spiral) (spare)	1	—	Tray, small stores, upper (in rectangular box).
Springs, traversing lever .. (spare)	2	—	Tray, small stores, upper.
Straps, supporting, front .. (spare)	2	2	On platform board.
Straps, supporting, rear .. (spare)	1	1	
Straps, trace.. .. .. (spare)	2	2	On platform board.
Stud, retaining stuffing box, hydraulic buffer .. .. .. (spare)	1	—	Tray, small stores, upper (in rectangular tin box).
Swingletree, Nos. 10A or 11 (spare)	1	1	On platform board.
Syringe, Q.F., 13 and 18-pr.	1§	—	Under lower tray, small stores.
Tools, packing gland, Q.F., 18-pr., collar	1	—	Tray, small stores, upper (in round tin box).
Tools, packing gland, Q.F., 18-pr., plug	1	—	Tray, small stores, lower.
Tools, withdrawing ring supporting packing, Q.F., 13 and 18-pr...	2	—	Tray, small stores, upper.

* Per sub-section.
† Lower tray.
‡ When limbers are fitted with new pattern hooks.
§ Per section.

LIMBERS—*continued.*

(Carriage and Ammunition Wagon.)

Articles.	Carriage.	Wagon.	Where carried.
Traces, saddlery .. .. .. pairs	1	1	On platform board.
Tugs, trace .. .. .. (spare)	2	2	On platform board.
Washers, drag, 2nd class, "C," capped wheels .. .. .. (spare)	1	1*	Under footboard, "near" side.
Washers, packing, hydraulic buffer sets (spare)	2	—	Tray, small stores, upper (in round tin box).

* Per sub-section.

AMMUNITION WAGONS.

Articles.	No.	Where carried.
Apparatus, adjusting, running out springs, Q.F., 18-pr..	1††	On platform board.
Blankets, G.S.	2	On top of ammunition box.
Box, lamp, siege, to hold 2	1	On footboard.
Boxes, grease, 14-lb.‖	2	Under platform board.
Bush, testing sighting, 3·3-in.	1**	In tray, small stores, A sub-section.
Cartridges, Q.F., 18-pr., shrapnel	38	In ammunition box.
Case, saw, hand	1	Lid of ammunition box.
§Catches, limber and perch hooks (spare)	1*	In tray, small stores.
Clips, cartridge, Q.F., 18-pr.	38	On cartridges.
Covers, apparatus, adjusting, running out springs	1††	On platform board.
Grease, lubricating .. .. .. lb.	28	In boxes.
Handspike, common, 6 feet..	1	Under perch.
Implements, ammunition—		
Keys, No. 18 (setting fuze)	2	In tray, small stores.
Indicator fuze, Q.F., 18-pr.	1	On top of ammunition box.
Kettles, camp, oval, 12-quarts	—	Under wagon, as required.
Lamps, siege	2	In box.
Lashing, tarred, 1 in. × 20 feet	1†	Under wagon, as required.
Lashing, tarred, 1 in. × 10 feet	1†	Under wagon, as required.
Line, white, 1 lb. skeins	1	Under tray, small stores.
Nut, actuating screw, brake gear (spare)	1*	In tray, small stores.
Ordnance, Q.F., 13 and 18-pr.—		
Bush, firing hole .. .. (spare)	1*	In tray, small stores.
Pole, draught, No. 18 .. (spare)	1‡	Under perch.
Rope, picketing, 66 feet	1	On platform board.
Saw, hand, 26-in.	1	In case, saw, hand.
Spanner, No. 93	1‡	In case, side of ammunition box.
§Spindle, catch, limber and perch hooks (spare)	1*	In tray, small stores.
§Spring, catch, limber and perch hooks (spare)	1	In tray, small stores.
Spring, spiral (clock type), range gear, Q.F., 13 and 18-pr. .. (spare)	1**	In tray, small stores.
Valise, horse shoe	1¶	Front of ammunition box.
Valises, tools (shoeing, wheelers, or saddlers)	—¶	Front of ammunition box.

* Per section.
‡ Per sub-section.
‖ Components of wagon.
** 1 per battery.
† For each ammunition wagon carrying a spare No. 18 pole.
§ When limbers are fitted with new pattern hooks.
¶ *See* footnote ‖, page 46.
†† Per battery, carried in "A" sub-section.

Note.—The spare pole is lashed in position as follows:—

Place the pole in position under the perch with the jointed parts to the rear; care must be taken that the ends do not project to the rear so as to get in the way of the wagon body shield, and prevent it being lowered.

Securely lash the pole by one of the lashings to the front end of the perch. This lashing should be passed round the pole through the pole tug. (The pole tug should be secured in the front tug hole of the pole.) With the second lashing, make fast one end to the iron loop supporting the pole, take a complete turn round each half of the pole and the loop separately, then pass the lashing twice round the ends of the pole and the loop, to prevent the pole working to the rear, and make fast.

WAGON, TELEPHONE.

Articles.	No.	Where carried.
Apron, basil, brown	1	Limber box, compartment C 1.
Axe, felling, curved helve	1	Under footplate of limber.
Axe, pick { Head, 4½ lb.	1	Near side, limber.
Axe, pick { Helve, 36-inch, ferruled...	1	Near side, limber.
Bar, carrying drum, wagon, telephone...	1	Top of limber box.
Bar, supporting draught pole, No. 3 (spare)	1	Platform board, limber.
Blocks, brake, field and transport (spare)	2	Limber box, compartment C 2.
Bolts, link, chain, endless, wagon, telephone ... ... (spare)	2*	Limber box, compartment D.
Bracket, pawl, winding gear, No. 198A wheel ... ... (spare)	1	Limber box, compartment D.
Brush, water, carriage	1	Near side, limber.
Buckets, water, G.S., canvas	2	Platform board, limber.
Cable, electric, D 1 ... ... miles	⅓	On reels, cable, No. 2.
Cable, electric, D 3 ... ... miles	4	On drums.
Can, oil, lubricating, 1 pint	1	Limber box, compartment E.
Catch, drum spindle bearing, wagon, cable and telephone ... (spare)	1*	Limber box, compartment D.
Cells, electric, inert, S., {	12	Limber box, compartment A.
Cells, electric, inert, S., { (spare) in box... ...	12	" " " "
Clip, strap, winding gear, wagon, telephone ... ... (spare)	1*	Limber box, compartment D.
Cloth, emery, No. F ... ...sheets	4	Limber box, compartment C 2.
Collar, adjusting, 2nd Class "C" capped wheels ... ... (spare)	1	Limber box, compartment B 3.
Cordage, spun yarn, hemp, tarred { 1 thread... lbs.	20	Limber box, compartment D.
Cordage, spun yarn, hemp, tarred { 3 thread... lbs.	5	" " " "
Covers, short rifle	2	Front of limber box.
Galvanometer, detector—		
Q and I	1	Limber box, compartment A.
Case	1	Limber box, compartment A.

* Packed in small wooden box, provided locally.

WAGON, TELEPHONE—*continued.*

Articles.	No.	Where carried.
Grease, lubricating ... ... lbs.	3	Grease box, under limber.
Guards, hand, telegraph equipment ...	2	Limber box, compartment D.
Guys, telegraph pole	8	Limber box, compartment B 4.
Hammer, claw, 14-oz.	1	Limber box, compartment C 2.
Hammer, R.E., telegraph, sledge ...	1	Off side, limber.
Hook, bill	1	Off side, limber.
Jumper	1	Under footplate of limber.
Ladder, field telegraph	1	Under wagon body.
Links, chain, endless, wagon, telephone { cranked (spare)	2*	Limber box, compartment D.
Links, chain, endless, wagon, telephone { ordinary (spare)	2*	Limber box, compartment D.
Oil, Rangoon ... ... pint	1	In oil can.
Pickets, guy, telegraph, light	20	Limber box, compartment C 2.
Pins, earth	9	Limber box, compartment C 1.
Pin, linch, 2nd Class "C" capped wheels ... ... (spare)	1	Limber box, compartment B 3.
Pipe, hose, rubber, ¼-inch ... feet	6	Limber box, compartment B 1.
Pliers, side cutting, 5-inch ... pairs	10	Limber box, compartment B 4.
Poles, telegraph, wood, 17 feet	8	Wagon body, between drums.
Reels, cable, No. 2	2	Wagon body.
Ropes, drag, light, G.S. ... ... pairs	1	Platform board, limber.
Solution, rubber, 3 oz. tubes ... tubes	6	Limber box, compartment B 1.
Spade, Mark III	1	Under limber, off side.
Spanner, adjustable, 11-inch	1	Limber box, compartment C 2.
Spanner, No. 184†	1	Limber box, compartment D.
Spindles, reel, cable, No. 2	2	Limber box, compartment B 2.
Spring, catch, drum spindle bearing, wagon, telephone ... (spare)	1*	" " " D.
Spring, catch, limber and perch hooks (spare)	1*	" " " "
Spring, seat, wagon, telephone (spare)	1*	" " " "
Sticks, crook, short	2	Top of limber box.
Strap, winding gear, wagon, telephone (spare)	1*	Limber box, compartment D.
Swingletree, No. 11 ... (spare)	1	Platform board, limber.
Tape, rubber ... ... ozs.	6	Limber box, compartment B 2.
Telephone sets, portable, D, Mark II ...	6	Limber box, compartment A.
Tools, electrician's (and materials for repair) ... ... set	1	In holdall, limber box compartment D.
Washer, drag, 2nd Class "C" capped wheels ... ... (spare)	1	Limber box, compartment B. 3.
Wire, electric, S. 11, Mark III yds.	40	Limber box, compartment D.

* Packed in small wooden box, provided locally.
† Component of vehicle.

CARRIAGE AND LIMBER.

LIMBER.

On platform board.

1 bar, supporting pole.
1 felling axe.
2 straps, trace.
2 tugs, trace.
1 swingletree.

1 line hambro.
1 pair traces, saddlery.
1 breast piece.
2 straps, supporting front.
1 strap, supporting rear.

1 box, grease, 3 lb. } *under.*
1 drag washer }

1 oil can, No. 3 (mineral oil) } *under.*
1 oil can, No. 3 (Rangoon oil) }

1 water-brush, *under.*

Fittings for 2 rifles on front of box.

1 billhook, *under.*

On top.

2 blankets.
1 carrier, ammunition.

1 key, No. 18 (setting fuze).*

12 rounds.	Upper tray. / Lower tray. / Sponge cloths. Syringe.†	12 rounds.

1 key, No. 18 (setting fuze).*
1 shovel, G.S.

6 canvas buckets, *under.*

6 canvas buckets, *under.*

Contents of upper tray.

pins, keep, split, various.
2 rings, packing.
6 screws, lubricating.
1 stud retaining stuffing box.
1 spring, sight clinometer.
2 springs, traversing lever.
1 tool, packing gland, collar.
2 tools, withdrawing ring.
2 sets washers, packing.
1 spring, catch, limber and perch hooks.

1 key spring lock, in pocket.

Contents of lower tray.

1 collar adjusting wheels.
3 files.
1 key, No. 17 (fixing fuze).
1 key, split, flat, 1 in. × 4 in.
1 pin, keep, split, ¼ in. × 5 in.
1 pin, capsquare.
1 pin, locking shield pawl.
2 springs, disc, No. 62.
1 tool, packing gland plug.
1 handle, file, small.

1 pin, linch.
2 keys, No. 18 (setting fuze).
1 pin, draught, No. 3.
2 plugs, filling hole.
1 spring, shield pawl.
2 springs, firing gear.

CARRIAGE.

1 spare sight clinometer in case on left tensile stay.

1 pickaxe, *under.*

Contents of tool case (on axletree).

1 brush, breech screw.
1 hammer.
1 key, removing jammed cartridges.‖
1 lanyard, firing.
1 spanners, McMahon, 15-inch. †
1 spanners, McMahon, 9-inch.
1 spanners, No. 214.
1 spanners, hyd. buffer, No. 122.
1 spanners, hyd. buffer, No. 123.
1 spanners, hyd. buffer, No. 129.
1 tool, withdrawing split pins.

1 funnel
1 pair pliers.

† 1 clinometer, field (in case) } on shield.
1 clinometer, sight (in case) }
1 telescope (in case) on axletree.

1 shovel.

1 can, lubricating, No. 9, on shield.
1 dial sight and carrier } on shield.
2 keys, No. 18 (setting fuze), in case }

In case on shield.

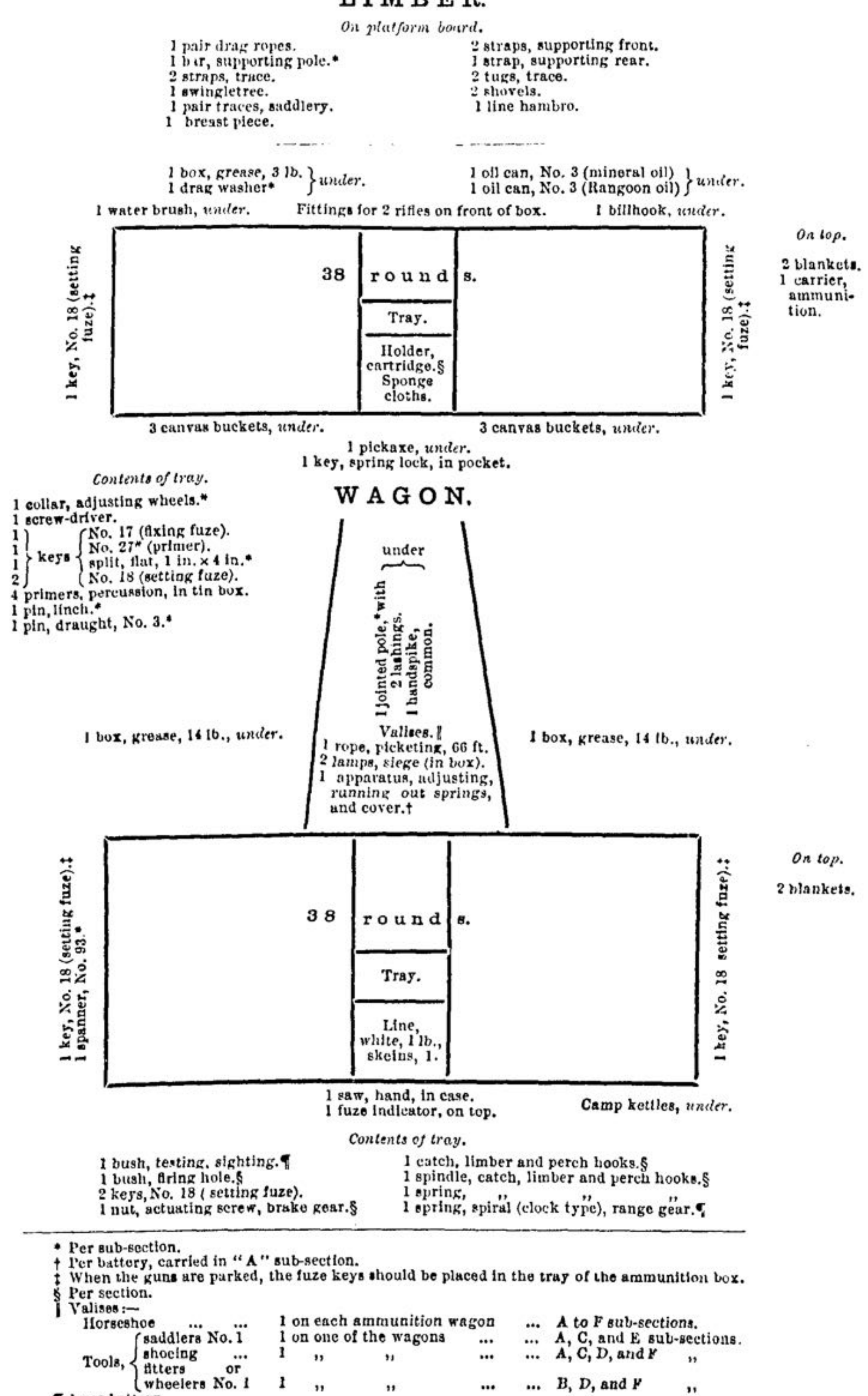
1 drift, No. 12.
1 gauge, striker, protrusion, No. 1.
1 screw-driver, G.S., 4 inch.
1 catch, retaining breech screw.
2 pins, firing.
2 springs, main.
2 springs, safety catch.
4 springs, trigger.
1 spring, tripping piece.
1 striker.

1 cleaner, piasaba } in tubular trail.
1 cleaner, wool }
1 cover, breech } on front of shield
1 cover, muzzle } when not on gun.
2 aiming posts, on front of shield.
1 pair drag ropes, on front of shield.

---

* When the guns are parked, the fuze keys should be placed in the tray of the ammunition box.
† 1 per section.
§ 1 per battery.
‖ 1 per battery, in A sub-section.

WAGON AND LIMBER.



* Per sub-section.
† Per battery, carried in "A" sub-section.
‡ When the guns are parked, the fuze keys should be placed in the tray of the ammunition box.
§ Per section.
‖ Valises:—

Horseshoe		1 on each ammunition wagon	... A to F sub-sections.
Tools,	saddlers No. 1	1 on one of the wagons ...	... A, C, and E sub-sections.
	shoeing ... fitters or	1 " " ...	... A, C, D, and F "
	wheelers No. 1	1 " " ...	... B, D, and F "

¶ 1 per battery.

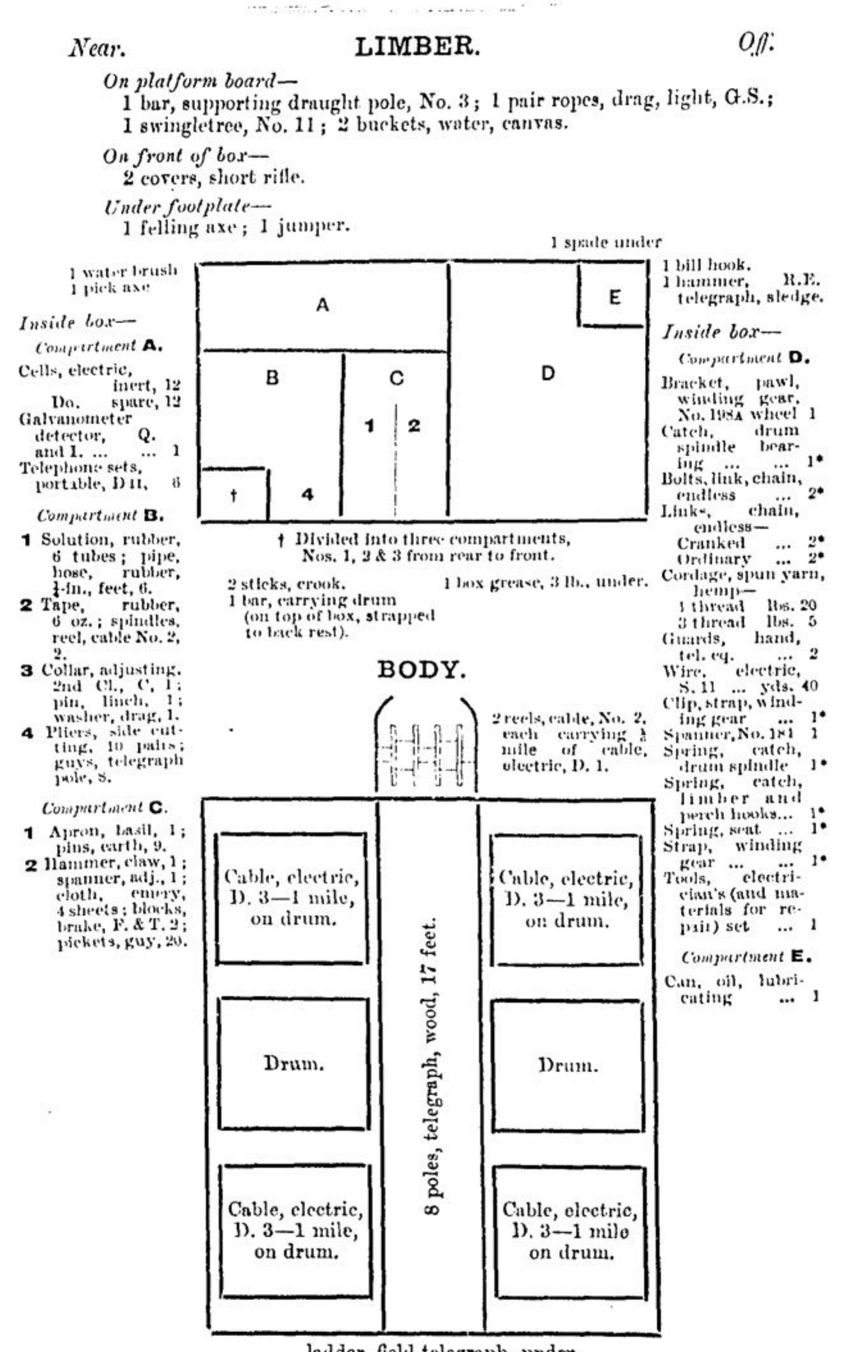
WAGON, TELEPHONE, MARK I.

Near. **LIMBER.** *Off.*

On platform board—
1 bar, supporting draught pole, No. 3; 1 pair ropes, drag, light, G.S.; 1 swingletree, No. 11; 2 buckets, water, canvas.

On front of box—
2 covers, short rifle.

Under footplate—
1 felling axe; 1 jumper.



Inside box—

Compartment **A.**

Cells, electric, inert, 12
Do. spare, 12
Galvanometer detector, Q. and I. 1
Telephone sets, portable, D II, 6

Compartment **B.**

1 Solution, rubber, 6 tubes; pipe, hose, rubber, ¼-in., feet, 6.
2 Tape, rubber, 6 oz.; spindles, reel, cable No. 2, 2.
3 Collar, adjusting, 2nd Cl., C, 1; pin, linch, 1; washer, drag, 1.
4 Pliers, side cutting, 10 pairs; guys, telegraph pole, 8.

Compartment **C.**

1 Apron, basil, 1; pins, earth, 9.
2 Hammer, claw, 1; spanner, adj., 1; cloth, emery, 4 sheets; blocks, brake, F. & T. 2; pickets, guy, 20.

Inside box—

Compartment **D.**

Bracket, pawl, winding gear, No. 198A wheel 1
Catch, drum spindle bearing 1*
Bolts, link, chain, endless ... 2*
Links, chain, endless—
Cranked ... 2*
Ordinary ... 2*
Cordage, spun yarn, hemp—
1 thread lbs. 20
3 thread lbs. 5
Guards, hand, tel. eq. ... 2
Wire, electric, S. 11 ... yds. 40
Clip, strap, winding gear ... 1*
Spanner, No. 181 1
Spring, catch, drum spindle 1*
Spring, catch, limber and perch hooks... 1*
Spring, seat ... 1*
Strap, winding gear 1*
Tools, electrician's (and materials for repair) set ... 1

Compartment **E.**

Can, oil, lubricating ... 1

* Packed in small wooden box provided locally.

(As to prices in brackets, see top of page 2.)

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